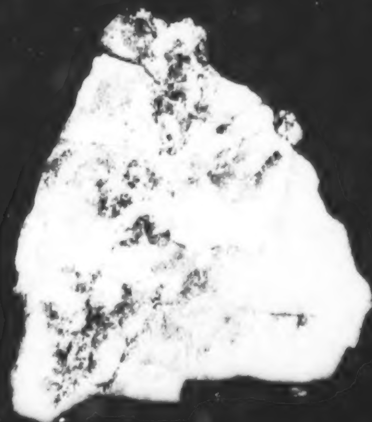
ROCKS AND MINERALS
FOR THE COLLECTOR

Geological Survey of Canada
Miscellaneous Report 57



Cobalt – Belleterre – Timmins
Ontario and Quebec

Ann P. Sabina

2000

Natural Resources Canada   Ressources naturelles Canada

Canada

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Cover illustration

Native silver, Castle-Trethewey mine, Gowganda. The specimen measures 9 cm by 5 cm. National Mineral Collection specimen no. 45683. Photograph by H. Gary Ansell. GSC 1999–003A

Native gold in quartz, Hoyle Pond mine, Timmins. The specimen measures 6 cm across. National Mineral Collection specimen no. 66493. Photograph by H. Gary Ansell. GSC 1999–003B

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Frontispiece. The original Hollinger (Timmins) mine, 1910, before it was destroyed by fire in 1911. (GSC 14003)

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Frontispiece. Hollinger (Timmins) mine 1910.

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Abstract

Occurrences of minerals, rocks, and fossils are described for localities in the Temagami, Cobalt, Gowganda, Matachewan, Matheson, and Timmins regions in Ontario, and in the Ville-Marie and Belleterre areas in Quebec. The collecting area includes two of the greatest precious metal mining camps in the world: the Cobalt silver camp, which ranks third in the total cumulative production of silver in the world, and the Porcupine gold field whose all-time production is exceeded only by the Witwatersrand gold mines in South Africa. In addition, there are numerous collecting localities in the less celebrated mining camps of Elk Lake, Gowganda, Matachewan, and Belleterre.

The spectacular discoveries of the Cobalt silver deposits in 1903 and 1904, following within a decade of the world-captivating Klondike Gold Rush, shifted the attention of prospectors and miners to this part of eastern Canada where the initial discoverers engaged in building the Timiskaming & Northern Ontario railway were joined by experienced prospectors from the West and elsewhere. Stimulated by successful developments at Cobalt and guided by geological reports issued by the Ontario Bureau of Mines and by the Geological Survey of Canada, the same band of prospectors extended their search to the then-remote north country and were rapidly rewarded with further discoveries of silver ore at Elk Lake and Gowganda, culminating in the sensational discoveries of native gold in the Porcupine district in 1909. Thus, within a few years, the area was the scene of the greatest silver rush and the greatest gold rush ever experienced in Ontario. With the establishment of these two mining camps, the attention of gold seekers was focused on Kirkland Lake, which became the second greatest gold-producing camp in Canada and the third-ranking gold producer in the world. About half a century later, northeastern Ontario was the scene of a modern-day prospecting rush generated by the discovery of a colossal base metal orebody in the Timmins area; that discovery became the largest silver-zinc-cadmium producer in the world.

Other deposits in the area include those of copper, copper-zinc, nickel, iron, and asbestos. There are also occurrences of molybdenite, barite, magnesite, and antimony minerals. Fossils occur in the only Paleozoic rocks in the area, which extend north from Lake Timiskaming. Rocks suitable for ornamental purposes include porphyry, jaspery iron formation, conglomerate, granite, soapstone, and chrome-mica rock.

Most collecting localities are dumps of inactive mines and prospects. Roadcuts provide a number of collecting sites. In general, operating mines are not collecting areas, but visits to surface plants can sometimes be arranged. Some famous old mines, no longer accessible, are described for historical interest.

Résumé

L'auteur décrit les indices de minéraux, de roches et de fossiles dans les régions de Temagami, de Cobalt, de Gowganda, de Matachewan, de Matheson et de Timmins, en Ontario, et dans les régions de Ville-Marie et de Belleterre, au Québec. Les zones propices au prélèvement d'échantillons comprennent deux des plus importants camps d'extraction de métaux précieux au monde : le camp minier de Cobalt, qui se classe troisième au monde pour la production cumulative totale d'argent, et le champ aurifère de Porcupine, dont la production jusqu'à présent n'est surpassée que par celle des mines d'or de Witwatersrand en Afrique du Sud. De plus, il existe de nombreux endroits favorables dans les camps miniers moins connus d'Elk Lake, de Gowganda, de Matachewan et de Belleterre.

La découverte spectaculaire des gisements d'argent de Cobalt en 1903 et 1904, dans les dix années qui ont suivi la célèbre ruée vers l'or du Klondike, a détourné l'attention des prospecteurs et des mineurs vers cette partie de l'est du Canada où les premiers découvreurs qui travaillaient

à la construction du chemin de fer Timiskaming and Northern Ontario ont été rejoints par des prospecteurs expérimentés de l'Ouest et d'ailleurs. Encouragés par le succès des explorations à Cobalt et guidés par les rapports géologiques du Bureau des mines de l'Ontario et de la Commission géologique du Canada, ces mêmes prospecteurs ont étendu leurs recherches vers les territoires isolés du Nord et ont rapidement fait la découverte de minerai d'argent à Elk Lake et à Gowganda, suivie de la découverte sensationnelle d'or natif dans le district de Porcupine en 1909. Ainsi, en quelques années, la région a été le théâtre de la plus grande ruée vers l'argent et vers l'or jamais connue dans la province. À la suite de l'établissement de ces deux camps miniers, l'attention des chercheurs s'est fixée sur la région de Kirkland Lake, qui s'est placée au deuxième rang parmi les régions productrices d'or au Canada et au troisième rang parmi les régions productrices d'or au monde. Environ un demi-siècle plus tard, les chercheurs ont concentré leur attention sur le nord-est de l'Ontario, suivant la découverte de l'immense gisement de métaux communs dans la région de Timmins; ce gisement est la plus importante exploitation d'argent, de zinc et de cadmium au monde.

D'autres gisements, soit de cuivre, de zinc, de nickel, de fer et d'amiante, se rencontrent dans cette même région. Il y a aussi des minerais de molybdénite, de barytine, de magnésite et d'antimoine. Des fossiles se rencontrent dans les seules roches paléozoïques de la région, soit celles qui s'étendent vers le nord à partir du lac Témiscamingue. Parmi les roches qui conviennent à des fins ornementales, il y a du porphyre, de la formation de fer jaspée, des conglomérats, du granite, de la pierre de savon et de la roche à chrome et mica.

La plupart des endroits favorables au prélèvement d'échantillons sont des haldes de mines inactives et des prospects. Les tranchées de route constituent aussi des sites propices. En général, les mines en exploitation ne sont pas accessibles mais, dans certains cas, des visites aux installations de surface peuvent être organisées. Quelques anciennes mines bien connues, qui ne sont plus accessibles, sont décrites à cause de l'intérêt historique qu'elles présentent.

ROCKS AND MINERALS FOR THE COLLECTOR: COBALT – BELLETERRE – TIMMINS, ONTARIO AND QUEBEC

INTRODUCTION

This booklet describes mineral, rock, and fossil occurrences in the Cobalt, Timmins, Temagami, Gowganda, Matachewan, and Matheson areas in Ontario, and in the Ville-Marie and Belleterre areas in Quebec. Occurrences in the adjacent area from Kirkland Lake, Ontario, to Val d'Or, Quebec, are described in *Rocks and minerals for the collector, Kirkland Lake–Noranda–Val d'Or; Ontario and Quebec*, by Ann P. Sabina (Geological Survey of Canada, Paper 73-30).

Most collecting localities are accessible by automobile from main roads and secondary roads; in some cases, a short hike is required. Directions to each occurrence are given in the text and are designed for use with official provincial road maps. Locality maps are included for deposits that may be difficult to find. Additional detailed information can be obtained from topographic and geological maps listed for each locality and available from agencies listed on page 180.

Many inactive mines have not been operated for several years and entering shafts, tunnels, and other workings is dangerous. Collecting in operating mines is generally not permitted; these mines are described only as a point of interest to the collector. Some occurrences are on private property and are held by claims; their listing in this booklet does not imply permission to visit them. Please respect the rights of property owners at all times.

Localities were investigated by the author in the summer of 1972 with the able assistance of Frances Gombos, and in 1992. Information provided by E.G. Bright, Ontario Ministry of Natural Resources, Timmins, L. Moyd, Canadian Museum of Nature, Ottawa, and L. Carson Brown, Ontario Ministry of Natural Resources, Toronto, facilitated field investigations and report preparation. Laboratory identification of minerals by X-ray diffraction was performed by G.J. Pringle and A.C. Roberts, microprobe analyses by A. Tsai, Geological Survey of Canada. Specimens for photography were obtained from the National Mineral Collection. This assistance is gratefully acknowledged.

COLLECTING ALONG THE ROUTE

The main routes for collecting localities are along Ontario Highway 11 from Cobalt to Matheson and Highway 101 from Matheson to Timmins. Side trips lead to the following collecting areas: Temagami, Cobalt, Elk Lake, Gowganda, Shining Tree, and Matachewan in Ontario, and Ville-Marie – Belleterre in Quebec. Distances in kilometres are shown in bold print in the text for the road log along the main route. The main route and side trips are shown in Figure 1.

Information on each locality is listed as follows: name of mine, quarry, or occurrence; minerals or rocks (in capital letters); mode of occurrence; brief description of the locality with special features of interest to the collector; location and access; references to other publications (indicated by a number which is listed in the References section beginning on page 183); map references (indicated by the letter T for maps of the National Topographic System and the letter G for geological maps of the Geological Survey of Canada (GSC), the Ontario Geological Survey (OGS) (Ontario Ministry of Northern Development and Mines), and the ministère des Ressources naturelles (MRNQ), Québec).

Table 1. Geological history

AGE (millions of years)	ERA	PERIOD	ROCKS FORMED	WHERE TO SEE THEM
	Cenozoic	Quaternary	Gravel, sand, clay, till	Lakeshores, stream-beds, eskers
		Tertiary	Not represented in collecting area	
65	Mesozoic		Not represented in collecting area	
225	Paleozoic	Permian Pennsylvanian Mississippian Devonian	Not represented in collecting area	
570		Silurian Ordovician	Limestone, dolomite, sandstone, shale	Dawson Point; roadcuts along Highway 65 East.
		Cambrian	Not represented in collecting area	
	PRECAMBRIAN ERA: Proterozoic		Nipissing diabase	Cobalt mines; roadcuts Highway 11 near junction Highway 11B; roadcuts Highway 560.
2480			Conglomerate	Roadcut Highway 11 km 98.9; Cobalt mines; Ragged Chute dam; roadcuts Highway 66 West.
			Greywacke, quartzite	Cobalt mines.
			Arkose	Cobalt mines; roadcuts Highway 560.
	PRECAMBRIAN ERA: Archean		Granite	Ville-Marie occurrences; roadcuts Highways 11, 66.
			Syenite, syenite porphyry	Roadcuts Highway 112; Young-Davidson, Matachewan Consolidated, Ryan Lake mines.
			Peridotite	Cedar Lake, Ryan Lake, Rahn Lake, Hedman, Alexo mines.
			Serpentinite	Bowman, Reeves mines.
			Dunite	Slade-Forbes mine.
			Gabbro, diorite	Temagami mine; roadcuts Highway 11.
			Granodiorite	Tyranite mine.
			Greywacke, argillite	Timmins area gold mines.
			Quartz-feldspar porphyry	Timmins area gold mines.
			Rhyolite	Temagami mine
			Andesite	Lorraine, Alexo mines.
			Volcanic rocks	Cobalt, Gowganda, Timmins mines.
			Basalt	Mount Kempis.
			Iron-formation	Sherman mine, Mattarow mine.
			Schist	Ronda, Northland, Kenilworth, Canadian Jamieson mines.

UNITS OF MEASUREMENT

Units of measurement from geological reports referred to in the text have been converted from the Imperial System to the International (metric) System (SI), using the following conversions:

1 inch = 2.54 cm	1 foot = 0.305 m
1 mile = 1.609 km	1 acre = 0.40469 ha
1 ounce (troy) = 31.103 g	1 pound = 0.453 kg
1 ton (short) = 0.907 t	1 oz (troy)/ton(short) = 34.285 g/t

A BRIEF GEOLOGICAL HISTORY

The entire collecting area is within the Canadian Shield – an immense body of Precambrian rocks occupying more than half of Canada and part of northern United States. During Precambrian time, repeated cycles of inundation, sedimentation, mountain building, intrusion, and erosion produced a variety of igneous, metamorphic, and volcanic rocks. These rock formations contain the great metallic mineral resources of northeastern Ontario and northwestern Quebec.

At the close of the Precambrian, a long period of erosion reduced the Shield to a nearly featureless plain and set the stage for uplift, inundation, and deposition that took place during the Paleozoic Era. Great thicknesses of sediments were deposited by Paleozoic seas over much of the Shield and still remain along its margins. The sedimentary rock formation north of Lake Timiskaming is a remnant of Paleozoic deposition.

In more recent times – during the Pleistocene – great ice sheets spread southward across the Shield, moulding the landscape as we know it today and leaving behind accumulations of sand, gravel, and till. As the ice withdrew, lake waters were ponded in an area extending north from Lake Timiskaming to form glacial Lake Ojibway-Barlow. Upon its retreat, the lake left a thick mantle of clay that forms the Great Clay Belt of northeastern Ontario and northwestern Quebec. Other deposits of recent times include beach sands and stream detritus.

Table 1 provides a summary of the geological history with examples of rocks formed.

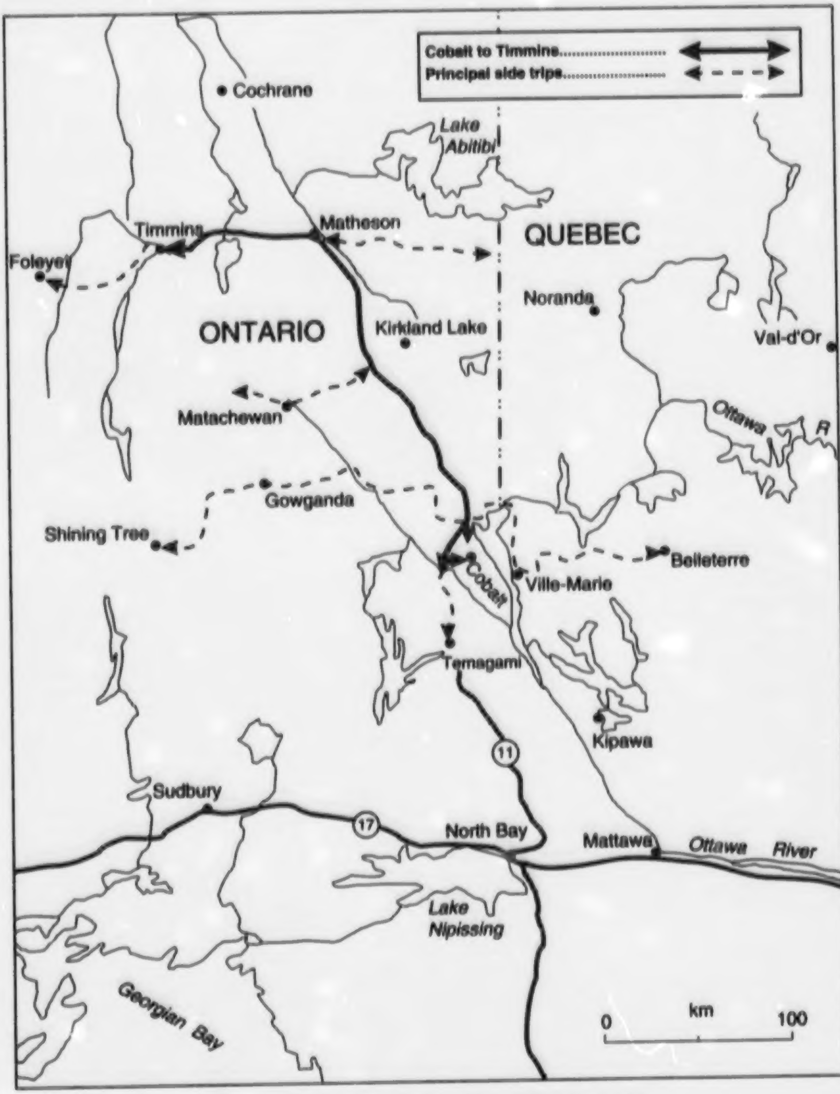

Figure 1. Index map showing collecting route.

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COBALT TO MATHESON

The starting point for the guidebook is at the junction of highways 11 and 11B at Cobalt. The main road log proceeds north along Highway 11.

Road log for localities along Highway 11, Cobalt to Matheson

km	0	Cobalt, at the junction of highways 11 and 11B. Road logs for Cobalt-Temagami (page 8) and Cobalt area (page 19) localities begin at this junction. The Cobalt to Matheson road log proceeds north along Highway 11.
km	3.2	Diabase with well-developed *jointing* is seen in *roadcuts*. Exposures extend to km 9.0.
km	12.2 - 14.8	Ordovician limestone containing crinoid fossils and cavities lined with microscopic crystals of calcite is exposed in *roadcuts*.
km	16.4	Junction, Highway 65. For mines along Highway 65, see page 66.
km	18.8	Junction, Highway 11B to New Liskeard. For mines in the New Liskeard area, see page 93.
km	27.7	Silurian limestone with abundant coral fossils is found in an inactive *quarry* on the east side of the road; some corals have been replaced by transparent microscopic crystals of calcite and quartz. Massive and botryoidal white chalcedony and white chalk-like quartz occur in the limestone. Similar rock is exposed in *roadcuts* on Highway 11 at km 28.9 and km 29.6.
km	68.2	Pink and grey granitic rocks are seen in *roadcuts*.
km	78.8	Junction, Highway 112. Precambrian granitic rocks are exposed at intervals along Highway 11 over about 14 km from this junction.
km	81.4	Grey granitic porphyry containing pink feldspar phenocrysts is exposed in *roadcuts*.
km	84.8 - 87.5	Pink syenite is exposed in *roadcuts*.
km	97.5	Gold-bearing volcanic rock was once explored by *shafts* on the west side of the highway, between a gravel pit and the highway.
km	97.8	Junction, Highway 66 to Matachewan and Kirkland Lake. For mines in the Matachewan area, see page 106; mineral and rock occurrences between Kirkland Lake and Val d'Or are described in *Rocks and minerals for the collector, Kirkland Lake–Noranda–Val d'Or, Ontario and Quebec*, by Ann P. Sabina (Geological Survey of Canada Paper [illegible]).
km	98.9	Proterozoic (Huronian) Cobalt conglomerate in *roadcuts* contains a variety of boulders up to 60 cm in diameter that are representative of the various rock types that existed in the area prior to formation of the conglomerate.
km	99.[illegible]	Kenogami Lake, at the bridge over Blanche River.

COBALT TO MATHESON

The starting point for the guidebook is at the junction of highways 11 and 11B at Cobalt. The main road log proceeds north along Highway 11.

Road log for localities along Highway 11, Cobalt to Matheson

km	**0**	Cobalt, at the junction of highways 11 and 11B. Road logs for Cobalt-Temagami (page 8) and Cobalt area (page 19) localities begin at this junction. The Cobalt to Matheson road log proceeds north along Highway 11.
km	**3.2**	Diabase with well-developed jointing is seen in *roadcuts*. Exposures extend to **km 9.0**.
km	**12.2 - 14.5**	Ordovician limestone containing crinoid fossils and cavities lined with microscopic crystals of calcite is exposed in *roadcuts*.
km	**16.4**	Junction, Highway 65. For mines along Highway 65, see page 66.
km	**18.8**	Junction, Highway 11B to New Liskeard. For mines in the New Liskeard area, see page 93.
km	**27.7**	Silurian limestone with abundant coral fossils is found in an *inactive quarry* on the east side of the road; some corals have been replaced by transparent microscopic crystals of calcite and quartz. Massive and botryoidal white chalcedony and white chalk-like quartz occur in the limestone. Similar rock is exposed in *roadcuts* on Highway 11 at **km 26.9** and **km 29.6**.
km	**68.2**	Pink and grey granitic rocks are seen in *roadcuts*.
km	**78.8**	Junction, Highway 112. Precambrian granitic rocks are exposed at intervals along Highway 11 over about 14 km from this junction.
km	**81.4**	Grey granitic porphyry containing pink feldspar phenocrysts is exposed in *roadcuts*.
km	**84.5 - 87.5**	Pink syenite is exposed in *roadcuts*.
km	**97.5**	*Gold-bearing volcanic rock* was once explored by shafts on the west side of the highway, between a gravel pit and the highway.
km	**97.8**	Junction, Highway 66 to Matachewan and Kirkland Lake. For mines in the Matachewan area, see page 104; mineral and rock occurrences between Kirkland Lake and Val d'Or are described in *Rocks and minerals for the collector, Kirkland Lake–Noranda–Val d'Or; Ontario and Quebec*, by Ann P. Sabina (Geological Survey of Canada Paper 73-30).
km	**98.9**	Proterozoic (Huronian) Cobalt conglomerate in *roadcuts* contains a variety of boulders up to 60 cm in diameter that are representative of the various rock types that existed in the district prior to formation of the conglomerate.
km	**99.1**	Kenogami Lake, at the bridge over Blanche River.

km	101.2	Cobalt conglomerate is exposed in *roadcuts*.
km	102.6	Dark volcanic rocks of Archean age are exposed in *roadcuts*. Similar rocks are seen at intervals for the next 25 km.
km	111.2	Historic plaque on right marks the southern boundary of the Arctic watershed; streams to the north flow into Hudson Bay, those to the south, into the Great Lakes – St. Lawrence River system.
km	116.2	Cobalt conglomerate is exposed in *roadcuts*.
km	121.3	Junction, road to Bourkes and the Bourkes mine (page 116).
km	129.4	Junction, road to Wavell.
km	131.0	Mount Kempis (left) is a prominent topographic feature rising 415 m above sea level and about 110 m above the surrounding area. It is underlain by black pillowed variolitic basalt. The lowland from which it rises is a former lake bottom occupied by Lake Ojibway-Barlow, which existed at the close of Pleistocene time; sediments left by the lake form an extensive clay belt that includes the region from Timmins to Val d'Or.
km	139.9	Junction, Highway 572. This highway provides access to Ross mine (page 117), Hislop gold mine (page 118), and Kelore mine (page 118).
km	153.3	Historic plaque on right commemorates the fire of July 1916, that devastated the region between Ramore and Iroquois Falls, claiming 223 lives.
km	154.8	Matheson, at the junction of Highway 101 East. Mines along Highway 101 east of Matheson are described on pages 122–13.
km	161.0	Junction, Highway 101 West. Mines in the Matheson-Timmins area are described on pages 137–179.

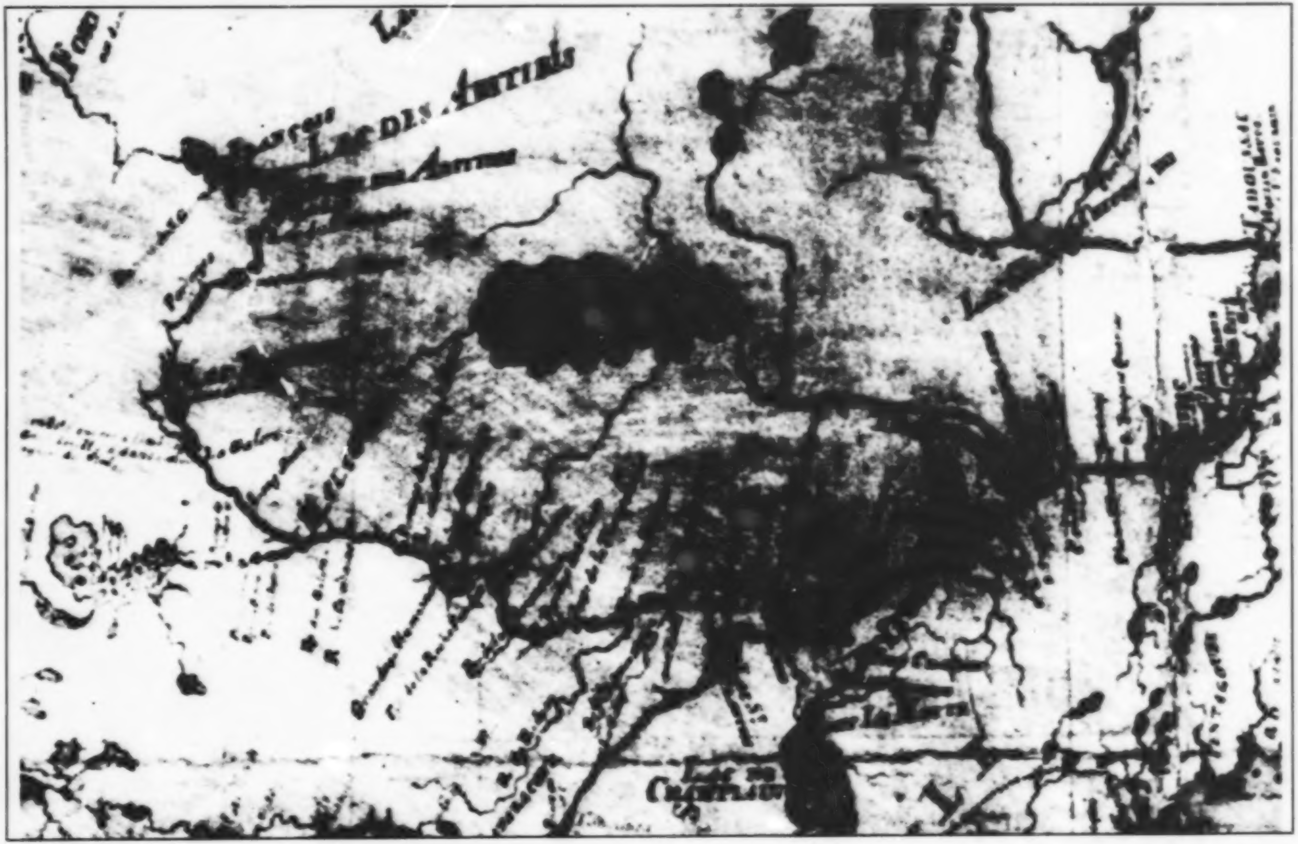

Figure 2. Part of Jean Baptiste Louis Franquelin's map of Canada: "Carte de l'Amerique septentrionnalle ... contenant les pays de Canada ou Nouvelle France ..." produced in 1688. At this early date, the lead deposit now known as the Wright Mine, was already a landmark since "Ance de la Mine" (the location of the mine) is indicated on the map below "LAC TEMISCAMING". (National Archives of Canada C54156).

M121

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COBALT TO TEMAGAMI

Mines are described in the text following the road log.

Road log for localities along Highway 11, Cobalt to Temagami

km	0	Junction, Highways 11 and 11B (turnoff to Cobalt); proceed south along Highway 11.
km	1.8	Road on left leads 0.6 km to the Cobalt refinery. Operations at the refinery ceased in 1971.
km	2.3	Proterozoic (Keweenawan) Nipissing diabase in roadcuts.
km	6.8	Latchford Mining Museum on left.
km	13.7	Proterozoic (Huronian) conglomerate is exposed in roadcuts on right. Conglomerate and diabase are seen in roadcuts over the next 6 km.
km	21.1	Archean (Keewatin) volcanic rocks are exposed in roadcuts.
km	21.8	Junction, Rib Lake Road on left.
km	22.2 - 23.9	Dark grey volcanic rocks are exposed in roadcuts.
km	24.3	Pike Lake.
km	24.6 - 25.1	Archean (Algoman) pink to grey granitic rocks are exposed in roadcuts.
km	25.7	[illegible] Lake on right.
km	26.3	Grey volcanic rocks are exposed in roadcuts over the next kilometre.
km	26.7	Junction, single-lane road (on right) to Northland mine (page 9).
km	28.0	Granite Lake on right.
km	28.5	Keewatin volcanic rocks with thick epidote coats on surfaces are exposed in roadcuts on left.
km	30.4	Pink and grey granitic rocks are exposed at intervals in roadcuts over the next 3 km.
km	[illegible]	Junction, [illegible] Road on left.
km	[illegible]	Picnic site at [illegible] Lake on right.
km	[illegible]	Junction (on left), trail leading east to Net Lake mine (page 9).
km	[illegible]	Bridge over Net Lake narrows.
km	[illegible]	Junction, road (on right) leading west to Cedar Lake mine (page 11).
km	[illegible]	Granitic rocks are exposed in roadcuts.

km	37.2	Junction (on right), single-lane road leading west to Little Dan mine (page 13).
km	37.5	Archean basalt is exposed in roadcuts.
km	38.8	Junction (on right), Milne-Sherman Road leading west to Sherman mine (page 13).
km	40.5	Temagami, at railway station.
km	41.8	Turnoff to Finlayson Point Park.
km	47.1	Junction on right, Temagami Mine Road to Temagami mine (page 14).
km	79.2	Junction, Highway 64.

Maps (T): 31 M/SW Haileybury
(G): P321 Haileybury, districts of Timiskaming and Nipissing (OGS, 1:126 720)

Northland mine

PYRITE, PYRRHOTITE, CHALCOPYRITE

In greenschist

Pyrite was formerly produced from this deposit. The ore consisted of massive pyrite with pyrrhotite and minor chalcopyrite. The deposit was discovered in 1903 and the Northland Mining Company worked it between 1906 and 1907. The workings consisted of a 91 m shaft and several opencuts located north of the shaft.

The mine is on the west shore of the southern part of James Lake. It is also referred to as the Rib Lake mine, the James Lake mine, and the Harris mine. See Map 1, No 5, on page 10.

Road log from Highway 11 at **km 26.7** (see road log on page 8):

km	0	Turn right (west) onto a single-lane road.
	0.3	Fork; bear right.
	0.6	South end of James Lake. The dump at the water's edge is visible from this point. Cross the creek and proceed 200 m along the shore to the mine.

Refs: 38 p. 132; 76 p. 40-41; 203 p. 104; 212 p. 71-72.

Maps (T): 31 M/4 Temagami
(G): 35c Anima-Nipissing Lake area, districts of Timiskaming and Nipissing, Ontario (Ontario Geological Survey, 1:63 360)
GDIF 158 Best Township, District of Nipissing (Ontario Geological Survey, 1:31 680)

Net Lake (Barton) mine

MOLYBDENITE, PYRITE, CHALCOPYRITE

In quartz veins cutting greenstone and in quartz breccia

Molybdenite occurs in quartz as individual flakes and as rosettes up to 15 mm in diameter. Some pyrite and chalcopyrite are associated with the ore.

COBALT TO TEMAGAMI

Mines are described in the text following the road log.

Road log for localities along Highway 11, Cobalt to Temagami

km	**0**	Junction, highways 11 and 11B (turnoff to Cobalt); proceed south along Highway 11.
km	**1.6**	Road on left leads 0.6 km to the Cobalt refinery. Operations at the refinery ceased in 1971.
km	**2.3**	Proterozoic (Keweenawan) Nipissing diabase in *roadcuts*.
km	**6.8**	Latchford Mining Museum on left.
km	**13.7**	Proterozoic (Huronian) conglomerate is exposed in *roadcuts* on right. Conglomerate and diabase are seen in *roadcuts* over the next 6 km.
km	**21.1**	Archean (Keewatin) volcanic rocks are exposed in *roadcuts*.
km	**21.6**	Junction, Rib Lake Road on left.
km	**22.2 - 24.0**	Dark grey volcanic rocks are exposed in *roadcuts*.
km	**24.5**	Pike Lake.
km	**24.6 - 25.1**	Archean (Algoman) pink to grey granitic rocks are exposed in *roadcuts*.
km	**25.7**	James Lake on right.
km	**25.9**	Grey volcanic rocks are exposed in *roadcuts* over the next kilometre.
km	**26.7**	Junction, single-lane road (on right) to Northland mine (page 9).
km	**28.0**	Granite Lake on right.
km	**28.2**	Keewatin volcanic rocks with thick epidote crusts on surfaces are exposed in *roadcut* on left.
km	**29.4**	Pink and grey granitic rocks are exposed at intervals in *roadcuts* over the next 3 km.
km	**31.9**	Junction, Andorra Road on left.
km	**34.4**	Picnic site at Net Lake on right.
km	**34.8**	Junction (on left), trail leading east to Net Lake mine (page 9).
km	**35.9**	Bridge over Net Lake narrows.
km	**36.0**	Junction, road (on right) leading west to Cedar Lake mine (page 11).
km	**36.4**	Granitic rocks are exposed in *roadcuts*.

km	**37.2**	**Junction (on right), single-lane road leading west to Little Dan mine (page 13).**
km	**37.5**	**Archean basalt is exposed in *roadcuts*.**
km	**38.8**	**Junction (on right), Milne-Sherman Road leading west to Sherman mine (page 13).**
km	**40.5**	**Temagami, at railway station.**
km	**41.8**	**Turnoff to Finlayson Point Park.**
km	**47.1**	**Junction on right, Temagami Mine Road to Temagami mine (page 14).**
km	**79.2**	**Junction, Highway 64.**

Maps (T): 31 M/SW Haileybury
(G): P321 Haileybury, districts of Timiskaming and Nipissing (OGS, 1:126 720)

Northland mine

PYRITE, PYRRHOTITE, CHALCOPYRITE

In greenschist

Pyrite was formerly produced from this deposit. The ore consisted of massive pyrite with pyrrhotite and minor chalcopyrite. The deposit was discovered in 1903 and the Northland Mining Company worked it between 1906 and 1907. The workings consisted of a 91 m shaft and several opencuts located north of the shaft.

The mine is on the west shore of the southern part of James Lake. It is also referred to as the Rib Lake mine, the James Lake mine, and the Harris mine. See Map 1, No 5, on page 10.

Road log from Highway 11 at **km 26.7** (see road log on page 8):

km	0	Turn right (west) onto a single-lane road.
	0.3	Fork; bear right.
	0.6	South end of James Lake. The dump at the water's edge is visible from this point. Cross the creek and proceed 200 m along the shore to the mine.

Refs: 38 p. 132; 76 p. 40-41; 203 p. 104; 212 p. 71-72.

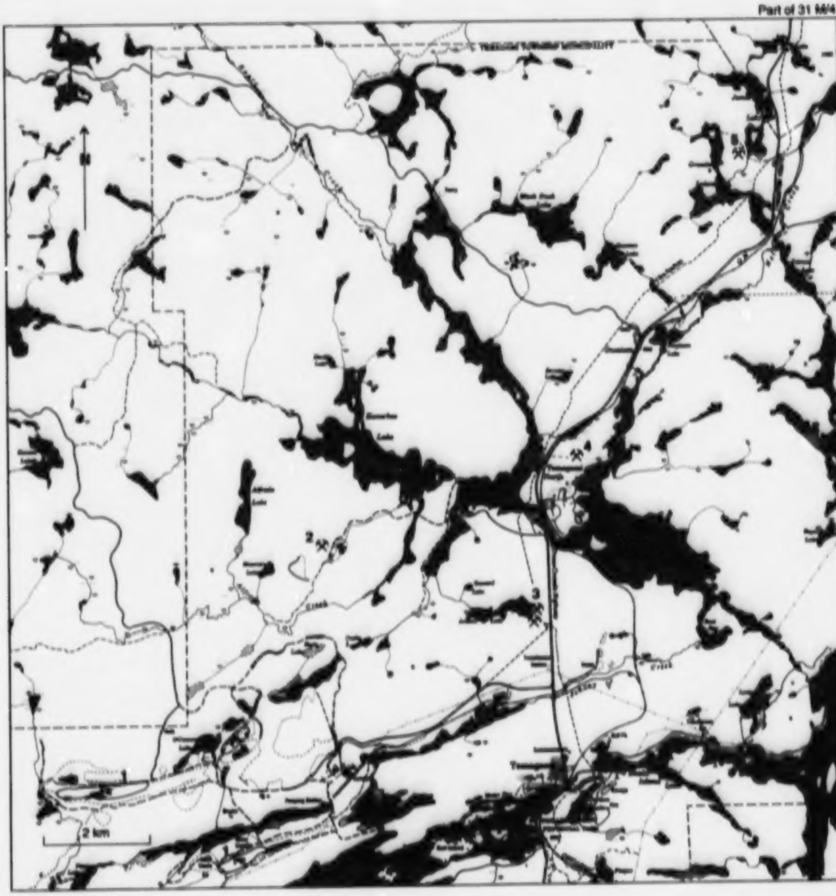
Maps (T): 31 M/4 Temagami
(G): 35c Anima-Nipissing Lake area, districts of Timiskaming and Nipissing, Ontario (Ontario Geological Survey, 1:63 360)
GDIF 158 Best Township, District of Nipissing (Ontario Geological Survey, 1:31 680)

Net Lake (Barton) mine

MOLYBDENITE, PYRITE, CHALCOPYRITE

In quartz veins cutting greenstone and in quartz breccia

Molybdenite occurs in quartz as individual flakes and as rosettes up to 15 mm in diameter. Some pyrite and chalcopyrite are associated with the ore.



Map 1. Temagami area

1. Sherman mine
2. Cedar Lake mine
3. Little Dan mine
4. Net Lake mine
5. Northland mine

A 15 m shaft was sunk in the deposit in about 1909 and approximately 181 t of rock and ore were removed; no ore shipments were made at the time. During World War I, J.W. Barton of Toronto shipped 550.8 kg of hand-cobbed ore to the Mines Branch, Ottawa, for recovery of 42.6 kg of molybdenite. Later, a fire destroyed the camp and boiler house; operations were not renewed.

The mine is on a ridge between Highway 11 and the west shore of Net Lake. Access is by an overgrown trail leading east from Highway 11 at **km 34.8** (see road log on page 8); the distance from the highway to the deposit is about 500 m. The shaft and dump are located at the end of the trail and small pits and dumps are found within 75 m to the north and east of the shaft. See Map 1, No. 4, on page 10.

Ref.: <u>210</u> p. 99-101.

Maps (T): 31 M/4 Temagami

(G): 2323 Chambers and Strathy townships, Nipissing district (Ontario Geological Survey, 1:31 630)

51e Northeastern portion of the Timagami Lake area, district of Nipissing (Ontario Geological Survey, 1:63 360)

P667 Strathy township, district of Nipissing (Ontario Ministry of Natural Resources, 1:15 840)

GDIF 201 Strathy Township, District of Nipissing (Ontario Geological Survey, 1:31 680)

Cedar Lake (Trebor, Cuniptau) mine

PYRRHOTITE, PENTLANDITE, CHALCOPYRITE, PYRITE, SERPENTINE, CALCITE, BROCHANTITE, ARAGONITE, TALC

In serpentinized peridotite

Pyrrhotite and pentlandite are associated with chalcopyrite and pyrite in calcite veins and in peridotite; they occur as disseminations and in massive form. Massive greyish to dark green serpentine is associated with the ore. White massive calcite fluoresces deep pink when exposed to 'long' ultraviolet rays. Bright green brochantite forms a finely granular encrustation on ore-bearing rock. Other minerals found in the dumps include aragonite as a white crust on pyrrhotite and talc as colourless silky flakes on calcite.

The deposit is located on a gossan-covered knoll on the west side of a pond south of Cedar-Kanichee (Cedar) Lake. See Map 1, No. 2, on page 10. The gossan represents alteration products (iron oxides) of the sulphide orebody. Early exploration work (prior to 1920) involved excavating several trenches and sinking two shafts. Between 1933 and 1936, Cuniptau Mines, Limited sank a 75 m shaft and installed a pilot smelter. Production amounted to 44 975.6 kg of copper, 29 641.6 kg of nickel, and small amounts of gold, silver, platinum, and palladium. The deposit was later investigated by Ontario Nickel Corporation, Limited (1937-1948) and by Trebor Mines Limited (1948-1949). Kanichee Mining Incorporated worked the property from an open pit from 1973 to 1976.

Road log from Highway 11 at **km 36.0** (see road log on page 8):

km	0	Turn right (west) onto a gravel road leading from the south side of the bridge over Net Lake narrows.
	0.15	Fork; bear left.

km 0.6 Junction; continue straight ahead.

1.9 Junction; continue straight ahead.

4.7 Cedar Lake mine on left.

Refs.: 103 p. 211-213; 131 p. 24; 169 p. 54-55; 172 p. 204-205; 252 p. 1, 21.

Maps (T): 31 M/4 Temagami

(G): 2323 Chambers and Strathy townships, Nipissing district (Ontario Geological Survey, 1:31 630)

51e Northeastern portion of the Timagami Lake area, district of Nipissing (Ontario Geological Survey, 1:63 360)

Plate 1

Banded jasper-magnetite iron-formation, Sherman mine. The specimen measures 21 cm by 18 cm. National mineral Collection specimen 65421. (GSC 1993-236C)

(G): P667 Strathy township, district of Nipissing (Ontario Geological Survey, 1:15 840)
GDIF 201 Strathy Township, District of Nipissing (Ontario Geological Survey, 1:31 680)

Little Dan mine

ARSENOPYRITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, JAROSITE, GOETHITE, CHLORITE

In veins cutting altered greenstone

The mine dumps contain arsenopyrite in massive form and as aggregates of microscopic crystals with pyrite, and with small amounts of pyrrhotite and chalcopyrite in sheared greenstone. Yellow jarosite and rusty-brown goethite form dull powdery coatings on ore-bearing rock. White granular calcite associated with sulphides fluoresces weakly reddish pink when exposed to 'long' ultraviolet rays.

The deposit was worked for gold carried by the arsenopyrite. Original development was started in about 1904 by Major R.G. Leckie. In the following years, three shafts were sunk to about 15 m and some ore was shipped. In 1933, Manitoba and Eastern Mines Limited acquired the property and extended shaft No. 1 to 160 m; operations were suspended in 1937. The No. 1 shaft and dump are located at the east end of Arsenic Lake; No. 2 shaft is at the southeast end of the lake, 275 m southwest of No. 1. Shaft No. 3 is about 350 m southeast of No. 1, near Highway 11.

A 0.3 km single-lane road leads west from Highway 11 at **km 37.2** (see road log on page 9) to shaft No. 1 near the shore of Arsenic Lake. See Map 1, No. 3, on page 10.

Refs.: 103 p. 217-218; 131 p. 35; 169 p. 52-54; 228 p. 170.

Maps (T): 31 M/4 Temagami
(G): 2323 Chambers and Strathy townships, Nipissing district (Ontario Geological Survey, 1:31 630)
51e Northeastern portion of the Timagami Lake area, district of Nipissing (Ontario Geological Survey, 1:63 360)
P667 Strathy township, district of Nipissing (Ontario Geological Survey, 1:15 840)
GDIF 201 Strathy Township, District of Nipissing (Ontario Geological Survey, 1:31 680)

Sherman mine

JASPER, MAGNETITE, HEMATITE, PYRITE, STILPNOMELANE, CHLORITE

In iron-formation

Jasper ranging from bright crimson-red to deep brownish red occurs in iron-formation consisting of interlayered bands of grey quartzite, jasper and chert, chloritic and tremolitic tuff, and finely granular magnetite. The rock takes a high polish and makes a striking ornamental stone. Hematite, pyrite (including nodules up to 5 cm in diameter), stilpnomelane, and chlorite have also been found in the deposit.

The iron ranges of the Timagami area have been known since 1899 and were investigated by trenching and diamond drilling in 1904 and 1905, and at various times after that. Recent exploration of the deposit was conducted by Voyager Exploration Limited (1957-1960) and Strathagami Mines Limited (1961-1965). Cliffs of Canada Limited undertook development of the property in 1966 and brought it into production in 1968. The mine consisted of three open pits and was equipped with a crusher, a concentrator, and a pellet plant. The annual output of one million tonnes of pellets was shipped by rail to the Dofasco plant in Hamilton. Operations ended in 1990.

The Milne-Sherman Road leads west from Highway 11 at **km 38.8** (see road log on page 9) to the mine, a distance of 5 km. The pits are 1.5 to 4.0 km from the plant; one is south of Tetapaga Lake, another is on the south side of Iron Lake, and another is at the southeast end of Vermillion Lake, which was partially dewatered to allow mining of the underlying orebody. See Map 1, No. 1, on page 10. A large specimen of iron ore and a viewing stand are located on the Milne-Sherman Road at a point 3.7 km from Highway 11.

Refs.: 10 p. 9-11; 111 p. 106-107; 131 p. 22-23; 235 p. 273; 238 p. 230, 251; 344 p. 79, 301.

Maps (T): 31 M/4 Temagami

(G): 2323 Chambers and Strathy townships, Nipissing district (Ontario Geological Survey, 1:31 630)

51e Northeastern portion of the Timagami Lake area, district of Nipissing (Ontario Geological Survey, 1:63 360)

P667 Strathy township, district of Nipissing (Ontario Geological Survey, 1:15 840)

GDIF 201 Strathy Township, District of Nipissing (Ontario Geological Survey, 1:31 680)

Temagami (Copperfields) mine

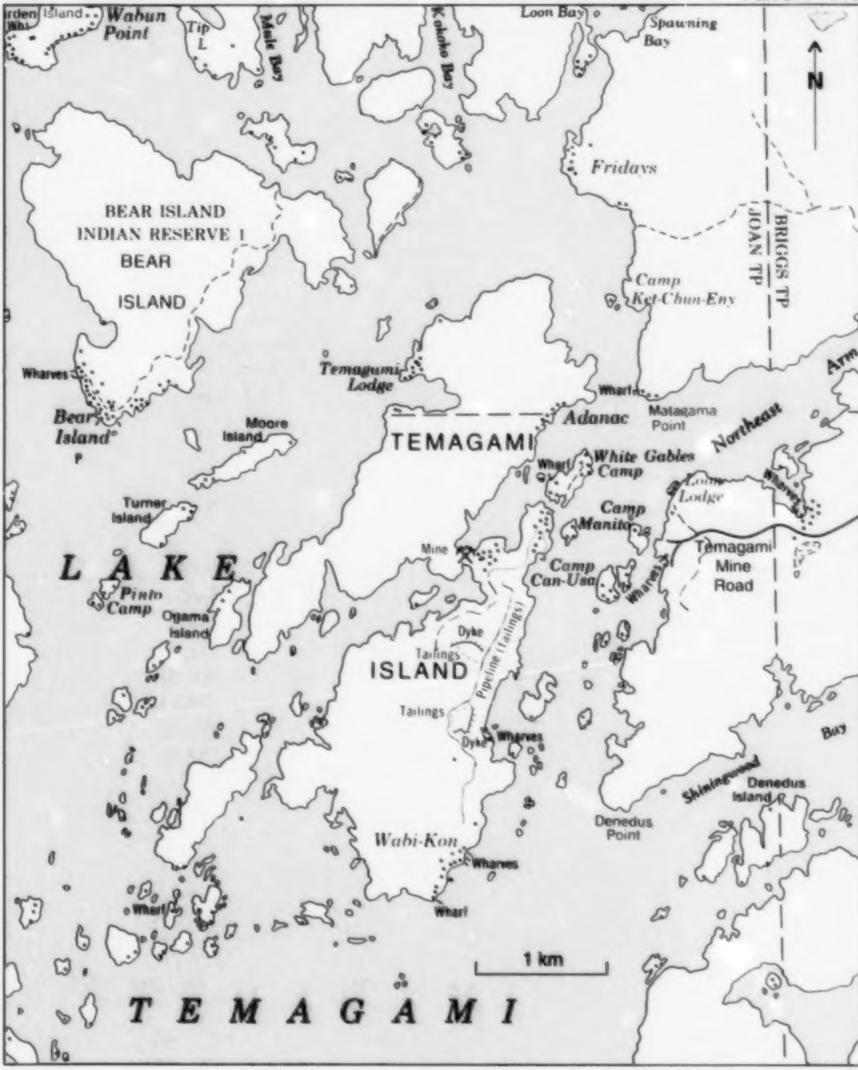
PYRITE, CHALCOPYRITE, MILLERITE, LINNAEITE, PYRRHOTITE, VIOLARITE, BRAVOITE, GERSDORFFITE, MAGNETITE, SPHALERITE, GALENA, SPERRYLITE

At the contact of diorite and rhyolite

This mine produced copper, gold, and silver. Two types of ore were mined: low grade pyrite ore and high grade chalcopyrite ore. In the former, chalcopyrite, millerite, linnaeite (or siegenite), pyrrhotite, and possible violarite and bravoite were associated with pyrite in rhyolite. The chalcopyrite ore contained pyrite, millerite (as grains and aggregates of striated acicular prismatic crystals up to 3 cm long), gersdorffite (as cubic crystals about 5 mm in diameter), magnetite, sphalerite (dark brown to black), galena (uncommon), and sperrylite (rare). Gangue minerals were quartz and dolomite; cavities in the gangue were commonly lined with quartz and carbonate crystals coated with crystals of sulphides. Porous, oval pyrite nodules are composed of irregularly stacked minute lustrous pyrite cubes with some quartz and dolomite.

Both open pit and underground methods were used to mine this deposit, which was discovered in the fall of 1951 during a diamond drilling campaign conducted by H.W. Knight Jr. Temagami Mining Company Limited intersected two high grade massive sulphide deposits in 1954 and started production the following year. Development consisted of two open pits and a 767 m shaft 460 m southwest of the pits. The mine was equipped with a 181 t per day mill. Operations ceased in 1972 due to exhaustion of the ore. Production at the end of 1971 amounted to nearly 5 436 000 kg of copper, 315 851 g of gold, and 5 811 940 g of silver from 581 636 t of ore milled. The company name was changed in 1964 to Copperfields Mining Corporation Limited.

Part of 41 I/16



Map 2. Temagami (Copperfields) mine, Temagami Island

The mine is on the south shore of the isthmus joining the northern and southern halves of Temagami Island in Temagami Lake. See Map 2 on page 15. Access is by boat over a distance of about 1.5 km, from the end of Temagami Mine Road on the eastern shore of Temagami Lake. Temagami Mine Road (about 17 km long) leads west from Highway 11 at a point 6.6 km south of Temagami village. (See road log on page 9.)

Refs.: 165 p. 317-321; 166 p. 27-43; 172 p. 201; 173 p. 25-27; 207 p. 369; 247 p. 117; 251 p. 97.

Maps (T): 41 I/16 Lake Temagami
(G): 2057 Northwestern Timagami area, Nipissing district (Ontario Geological Survey, 1:31 680)
GDIF 119 Joan Township, District of Nipissing (Ontario Geological Survey, 1:31 680)

COBALT DISTRICT

Deposits in the Cobalt-South Lorrain-Elk Lake-Gowganda area have yielded some 18 661 800 000 g of silver (about 88 per cent of which come from the Cobalt camp), 20 385 000 kg of cobalt, 7 248 000 kg of nickel, and 2 265 000 kg of copper since silver ore was discovered at Cobalt in 1903. This area ranks as one of the greatest silver-producing areas of all time, after Potosi, Bolivia, and Butte, Montana; it produced the highest grade of silver ever mined in quantity.

The discovery was made by Fred LaRose, a former miner from the phosphate mines north of Ottawa and a blacksmith employed in the construction of the Timiskaming and Northern Ontario railway. The first silver claims were filed by two woodsmen employed in cutting railway ties – James H. McKinley and Ernest F. Darragh – who, after noticing fragments of a white metal stuck to timber dragged over the ground, located a vein containing flakes of native silver at the south end of Cobalt Lake (known at the time as Long Lake); their samples assayed 137 140 g/t. The discovery, staked jointly by LaRose and his foreman, Duncan McMartin, was registered as a copper property, nickeline being mistaken for native copper. In staking the claim, LaRose and McMartin failed to notice the blackened plates and nuggets of native silver embedded in a weathered surface vein on the claim; these were later identified by Willet G. Miller of the Ontario Bureau of Mines. The LaRose-McMartin claim was developed as the LaRose mine, and claims staked later in the year by Tom Hebert and Neil King became the Nipissing mine and the O'Brien mine respectively.

News of these phenomenally rich surface showings reached the Ontario Bureau of Mines and Willet G. Miller, first provincial geologist of Ontario, was commissioned to investigate the deposits. He collected a suite of spectacular specimens of native silver from the LaRose claim, for the Bureau, assisted prospectors in identifying the silver-cobalt-nickel ore, and reported the discovery of a new silver field to the mining world; on his return to the area in 1904, he named the new railway station Cobalt, which he deemed more appropriate than the existing name (Long Lake). The prospecting rush that began in 1905 was sparked by news of the sensationally rich first shipment of ore that contained slabs of native silver and was made by William G. Trethewey in 1904. All of Coleman Township was rapidly staked, and the number of companies organized to develop the deposits swelled from 4 in 1904 to 405 in 1905. The camp drew experienced miners from the declining mica-apatite mines of the Gatineau-Lièvre district. Silver output increased from 6 434 433 g in 1904 to 76 244 525 g in 1905, and the yield of each successive year doubled

that of the preceding year until 1908 when the output reached 604 576.4 kg of silver. In 1904, the camp outranked the Lake Superior district which until then was Ontario's leading producer of silver.

In the wake of the Cobalt discoveries, prospecting activities spread and discoveries of silver ore were made in Casey and Harris townships (New Liskeard area) in 1906, at Elk Lake and Maple Mountain in 1906, in South Lorrain Township in 1907, and in the Miller Lake-Gowganda Lake area in 1908. Silver production peaked at 979 986 823 g in 1911; it continued at a high level until the early 1920s. By 1929, most mines had ceased operations due to a marked decrease in silver prices and to depletion of the ore, and Silver Centre, at the southern end of the silver-mining area, became a ghost town. The decline was interrupted in 1950-1951 and again in 1960 when demand for cobalt and later for silver resulted in renewed activity in some of the old mines and in the discovery of new veins. By 1963, eight mines were operating in the Cobalt and Gowganda areas but this was reduced to three in 1972. Silver production in the Cobalt area ended in 1990.

Cobalt's importance lies not only in the mineral wealth it provided, but also in the strong stimulus it gave prospectors to extend their search into the then-remote areas to the northwest, the north, and the northeast. Their efforts were rewarded within a decade with discoveries of additional silver fields at Gowganda, Elk Lake, Maple Mountain, and South Lorrain, and of gold fields at Porcupine, Larder Lake, Kirkland Lake, and the adjacent area in Quebec.

An annual Miner's Festival featuring special events related to the historic mining era is held at Cobalt in August.

Refs.: 45 p. 7-14; 59 p. 4-5; 60 p. 7-8; 143 p. 1-7; 151 p. 130-131; 155 p. 689-692; 170 p. 2-5.

Maps (T): 31M Ville-Marie
(G): 2361 Sudbury-Cobalt, Algoma, Manitoulin, Nipissing, Parry Sound, Sudbury, and Timiskaming district (Ontario Geological Survey, 1:253 440)
GDIF 462 Harris Township (Ontario Geological Survey, 1:31 680)
GDIF 480 South Lorrain, District of Nipissing (Ontario Geological Survey, 1:31 680)
GDIF 499 Gillies Limit Township (Ontario Geological Survey, 1:31 680)
GDIF 502 Lorrain Township (Ontario Geological Survey, 1:31 680)

Cobalt district silver mines

NATIVE SILVER, NICKELINE, SMALTITE, ALLARGENTUM, DYSCRASITE, SAFFLORITE, SKUTTERUDITE, COBALTITE, ARSENOPYRITE, BREITHAUPTITE, CHALCOPYRITE, TETRAHEDRITE, ACANTHITE, GALENA, MARCASITE, SPHALERITE, PYRITE, PYRARGYRITE, STEPHANITE, CLINOSAFFLORITE, RAMMELSBERGITE, GLAUCODOT, ALLOCLASITE, PYRRHOTITE, GRAPHITE, NATIVE BISMUTH, DJURLEITE, BISMUTHINITE, VIOLARITE, GOETHITE, MOLYBDENITE, MILLERITE, SAMSONITE, BORNITE, SIEGENITE, FREIESLEBENITE, NATIVE GOLD, NATIVE ARSENIC, DOLOMITE, CALCITE, CHLORITE, ALBITE, ACTINOLITE, HEMATITE, MAGNETITE, TITANITE, RUTILE, ANATASE, EPIDOTE, ALLANITE, WOLFRAMITE, APATITE, AXINITE, STILPNOMELANE, PREHNITE, ERYTHRITE, ANNABERGITE

In carbonate veins cutting Archean volcanic rocks, Proterozoic sedimentary rocks, and Nipissing diabase, and in wall rock

The ores are believed to have originated from the intrusion of diabase sheets into existing sedimentary and volcanic rocks. Most of the ore was mined from above the 500-foot level except at the Miller Lake (Gowganda area) mines where ore persisted to depths of over 300 m. Ore-bearing calcite and dolomite veins occupy fractures and faults in volcanic and sedimentary rocks, and in diabase.

The most characteristic minerals of the veins are native silver, nickeline (niccolite), and smaltite. Native silver – the chief ore mineral – is intimately associated with allargentum and dyscrasite (rare), forming mixtures in which individual minerals are indistinguishable in hand specimens. Silver generally occurs as masses or slabs, as grains, flakes, films, wires, irregular veinlets, and filliform or dendritic forms in white, grey, or black calcite, and in intergrowths of metallic minerals of which the most common constituents are nickeline and smaltite or safflorite; it rarely occurs as crystals.

The most important nickel and cobalt minerals are nickeline (niccolite), smaltite, and safflorite. They occur individually and as complex intergrowths forming grains, or granular, botryoidal, and colloform masses, or rosette-like and dendritic aggregates, and veinlets in carbonate (calcite or dolomite) veins up to 1.2 m wide (the average width being less than 5 cm) and 1067 m long. Ore minerals occur less commonly in wall rock adjacent to the veins and in shear zones in which calcite cements rock fragments dislodged by rock movement. Minerals commonly associated with the principal ore minerals include skutterudite, cobaltite, arsenopyrite, breithauptite (an indicator of high grade ore), chalcopyrite, tetrahedrite, acanthite, galena, marcasite, sphalerite, pyrite, pyrargyrite, and stephanite. Other constituents are clinosafflorite, rammelsbergite, glaucodot, alloclasite, pyrrhotite, graphite, native bismuth, djurleite, bismuthinite, violarite, goethite, molybdenite, millerite (as hair-like crystals), samsonite, bornite, siegenite, freieslebenite, native gold, and native arsenic; these minerals are generally intergrown, many occurring in small amounts recognized only by microscopic examination.

Gangue minerals that contain ore minerals in the veins are predominantly grey or pink dolomite (weathers brown) and pink, white, grey, or black calcite (generally more translucent than dolomite); the grey to black colour of the carbonates is due to inclusions of metallic minerals (sulphides and arsenides) and is an indication of an ore-bearing vein. Quartz and chlorite are also important gangue minerals; minor constituents include albite, actinolite, hematite, magnetite, titanite, rutile, anatase, epidote, allanite, wolframite (rare), apatite (microscopic crystals), axinite (microscopic crystals), stilpnomelane (rare), and prehnite (rare). Carbonates in vugs in some of the mines fluoresce when exposed to ultraviolet rays. In addition to occurring in ore veins, epidote occurs with calcite in veins cutting diabase.

Secondary minerals associated with the orebody are pink to rose erythrite and light green annabergite; they generally occur as powdery encrustations on ore specimens. Minerals other than those listed have been found only in certain mines and are noted in the appropriate descriptions in the text.

White, grey, charcoal, or pinkish carbonates variously patterned with silvery-grey and pinkish-grey metallic ore minerals present a contrasting lustre when polished, resulting in an attractive stone that is used locally for jewellery. Equally attractive is the rock known as Cobalt conglomerate that occurs in many of the mines; its black matrix encloses pink to red granite pebbles from a few millimetres to several centimetres in diameter. It takes a good polish and is suitable for use as an ornamental stone.

Specimens can be collected from dumps at numerous inactive mines near Cobalt. Descriptions are given for mines that are readily accessible. Tours of surface plants of operating mines are conducted by the companies involved at specified times, and arrangements should be made in advance by writing to the appropriate company.

Refs.: 89 p. 24-27; 90 p. 239-249; 91 p. 280-282, 286-288; 103a p. 35-40; 127 p. 9-29; 145 p. 76-79; 146 p. 108-139; 142 p. 150-186; 141 p. 187-195; 144 p. 196-231; 151 p. 130-131.

Maps (T): 31 M Ville Marie
(G): 2361 Sudbury-Cobalt Algoma, Manitoulin, Nipissing, Parry Sound, Sudbury, and Timiskaming district (Ontario Geological Survey, 1:253 440)

Road log to the Cobalt district mines

Each mine is described on the page indicated in parentheses following the name of the mine.

km	0	Junction (southern) of highways 11 and 11B; proceed onto Highway 11B.
km	1.0	Junction, Gillies Depot Road on right.
km	2.4	Conglomerate is exposed on left. The rock is Huronian in age and its pebbles and boulders represent most of the older rock types of the region; pink granite pebbles or boulders are characteristic of this rock and distinguish it from an older conglomerate in the district. (Ref.: 127 p. 85)
km	3.5	Archean (Keewatin) volcanic rocks are exposed along the highway; rocks of this age are the oldest in the district.
km	4.8	Junction, West Cobalt Road South on left.
km	5.5	Junction, West Cobalt Road North on left and Coleman Road on right. The road log for mines along Coleman Road is given on page 26.
km	6.0	Townsite mine on right (page 20).
km	6.05	Highway bends to the right; road straight ahead leads to Buffalo mine (page 20).
km	6.7	Cobalt Mining Museum. Tours to mines in the area start here.
km	6.8	Highway turns sharply to the right; road on left leads to Coniagas mine (page 22). The headframe encased by the grocery store is shaft No. 4 of the Coniagas mine.
km	6.85	Cobalt Lake (295 m above sea level) on right; road on left leads to the Nipissing mine (page 23) and to the Hudson Bay mine (page 25).
km	7.4	Junction at LaRose bridge. The road log for mines along Brady Lake Road begins at this junction (see page 34).
km	8.4	Highway parallels a ridge capped by conglomerate.
km	8.7	Junction, Cross Lake Road on right. The road log for mines along Cross Lake Road is given on page 51.
km	11.3	Junction, Cross Lake Road on right.
km	11.4	Junction, Highway 567 to Silver Centre, a former mining community that ceased to exist when the once-flourishing mines closed. The road log to mines along Highway 567 is given on page 54. The main road log continues along Highway 11B toward New Liskeard.

Refs.: 89 p. 24-27; 90 p. 239-249; 91 p. 280-282, 286-288; 103a p. 35-40; 127 p. 9-29; 145 p. 76-79; 146 p. 108-139; 142 p. 150-186; 141 p. 187-195; 144 p. 196-231; 151 p. 130-131.

Maps (T): 31 M Ville Marie

(G): 2361 Sudbury-Cobalt Algoma, Manitoulin, Nipissing, Parry Sound, Sudbury, and Timiskaming district (Ontario Geological Survey, 1:253 440)

Road log to the Cobalt district mines

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km	**3.5**	**Archean (Keewatin) volcanic rocks are exposed along the highway; rocks of this age are the oldest in the district.**
km	**4.8**	**Junction, West Cobalt Road South on left.**
km	**5.5**	**Junction, West Cobalt Road North on left and Coleman Road on right. The road log for mines along Coleman Road is given on page 26.**
km	**6.0**	**Townsite mine on right (page 20).**
km	**6.05**	**Highway bends to the right; road straight ahead leads to Buffalo mine (page 20).**
km	**6.7**	**Cobalt Mining Museum. Tours to mines in the area start here.**
km	**6.8**	**Highway turns sharply to the right; road on left leads to Coniagas mine (page 22). The headframe encased by the grocery store is shaft No. 4 of the Coniagas mine.**
km	**6.85**	**Cobalt Lake (295 m above sea level) on right; road on left leads to the Nipissing mine (page 23) and to the Hudson Bay mine (page 25).**
km	**7.4**	**Junction at LaRose bridge. The road log for mines along Brady Lake Road begins at this junction (see page 34).**
km	**8.4**	**Highway parallels a ridge capped by conglomerate.**
km	**8.7**	**Junction, Cross Lake Road on right. The road log for mines along Cross Lake Road is given on page 51.**
km	**11.3**	**Junction, Cross Lake Road on right.**
km	**11.4**	**Junction, Highway 567 to Silver Centre, a former mining community that ceased to exist when the once-flourishing mines closed. The road log to mines along Highway 567 is given on page 54. The main road log continues along Highway 11B toward New Liskeard.**

km	**14.5**	**Haileybury, at the junction of Highway 588.**
km	**23.0**	**New Liskeard, at the junction of Highway 65 (at Paget and Whitewood streets). The road log for occurrences along Highway 65 is given on page 66.**
km	**24.9**	**Junction, Highway 65 East. This highway provides access to the Dawson Point occurrence, and the Langis mine, and to the following localities in adjacent Quebec: Wright mine, Ville-Marie granite occurrences, Lorraine mine, and Belleterre mine; descriptions begin on page 93.**
km	**25.7**	**Junction, Highway 11.**

Townsite mine

This former silver-cobalt-nickel-copper producer was originally worked in 1906 by Cobalt Townsite Mining Company Limited; it yielded some 405 000 000 g of silver from 1908 to 1917. Production ceased in 1939. During operations, several boulders weighing about a tonne and composed of high grade silver ore were found in the overburden on the claim. The original operator worked the deposit until 1914, and 1932 mining was conducted by Mining Corporation of Canada Limited. Total production amounted to 410 027 925 g of silver and 1865 kg of cobalt.

Most of the production was from a 131 m shaft on the south side of Highway 11B at **km 6.0** (see road log on page 19). Another shaft (98 m deep) is located at the intersection on the opposite side of the road. Two other shafts were opened on the property. See Map 3, No. 1, on page 21.

Refs.: 103a p. 78-81; 170 p. 112-113; 200 p. 100-104.

Maps (T): 31 M/5 Cobalt

(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Buffalo mine

The original claim was staked in 1904 on a smaltite-bearing vein discovered by Alexander Longwell. From 1905 to 1959, this mine produced some 435 442 000 g of silver and about 67 950 kg of cobalt. The sulphides galena, chalcopyrite, sphalerite, arsenopyrite, and pyrite were associated with the silver and cobalt ores. The mine was worked from numerous shafts, the deepest being 72 m, along a ridge on the west side of Cobalt. Early work (1906 to 1919) was done by Buffalo Mines Limited; subsequent operators included Mining Corporation of Canada Limited (1919 to 1932) and Cobalt Properties Limited (1934 to 1939). In 1949 and in the 1960s, small-scale work was performed by R.C. McAllister and partners.

To reach the mine, follow the road leading north from Highway 11B at **km 6.05** (see road log on page 19). The main working (shaft No. 12) is 4.6 m north of Highway 11B, and others are within 244 m to the north and northwest of No. 12; all are on the west side of the road. Shaft No. 7 is reached by following the road leading west from the Townsite mine for 300 m. Across the road from shaft No. 12 is the City of Cobalt mine, which produced 435 442 000 g of silver and some cobalt between 1907 and 1932. See Map 3, No. 2, on page 21.

Refs.: 45 p. 12; 98 p. 132; 103a p. 66-70; 127 p. 20; 158 p. 124; 159 p. 155; 160 p. 141; 170 p. 94-95, 102; 199 p. 162-169.

km	14.5	Haileybury, at the junction of Highway 588.
km	23.0	New Liskeard, at the junction of Highway 65 (at Paget and Whitewood streets). The road log for occurrences along Highway 65 is given on page 66.
km	24.9	Junction, Highway 65 East. This highway provides access to the Dawson Point occurrence, and the Langis mine, and to the following localities in adjacent Quebec: Wright mine, Ville-Marie granite occurrences, Lorraine mine, and Belleterre mine; descriptions begin on page 93.
km	25.7	Junction, Highway 11.

Townsite mine

This former silver-cobalt-nickel-copper producer was originally worked in 1906 by Cobalt Townsite Mining Company Limited; it yielded some 405 000 000 g of silver from 1908 to 1917. Production ceased in 1939. During operations, several boulders weighing about a tonne and composed of high grade silver ore were found in the overburden on the claim. The original operator worked the deposit until 1914, and 1932 mining was conducted by Mining Corporation of Canada Limited. Total production amounted to 410 027 925 g of silver and 1865 kg of cobalt.

Most of the production was from a 131 m shaft on the south side of Highway 11B at **km 6.0** (see road log on page 19). Another shaft (98 m deep) is located at the intersection on the opposite side of the road. Two other shafts were opened on the property. See Map 3, No. 1, on page 21.

Refs.: 103a p. 78-81; 170 p. 112-113; 200 p. 100-104.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Buffalo mine

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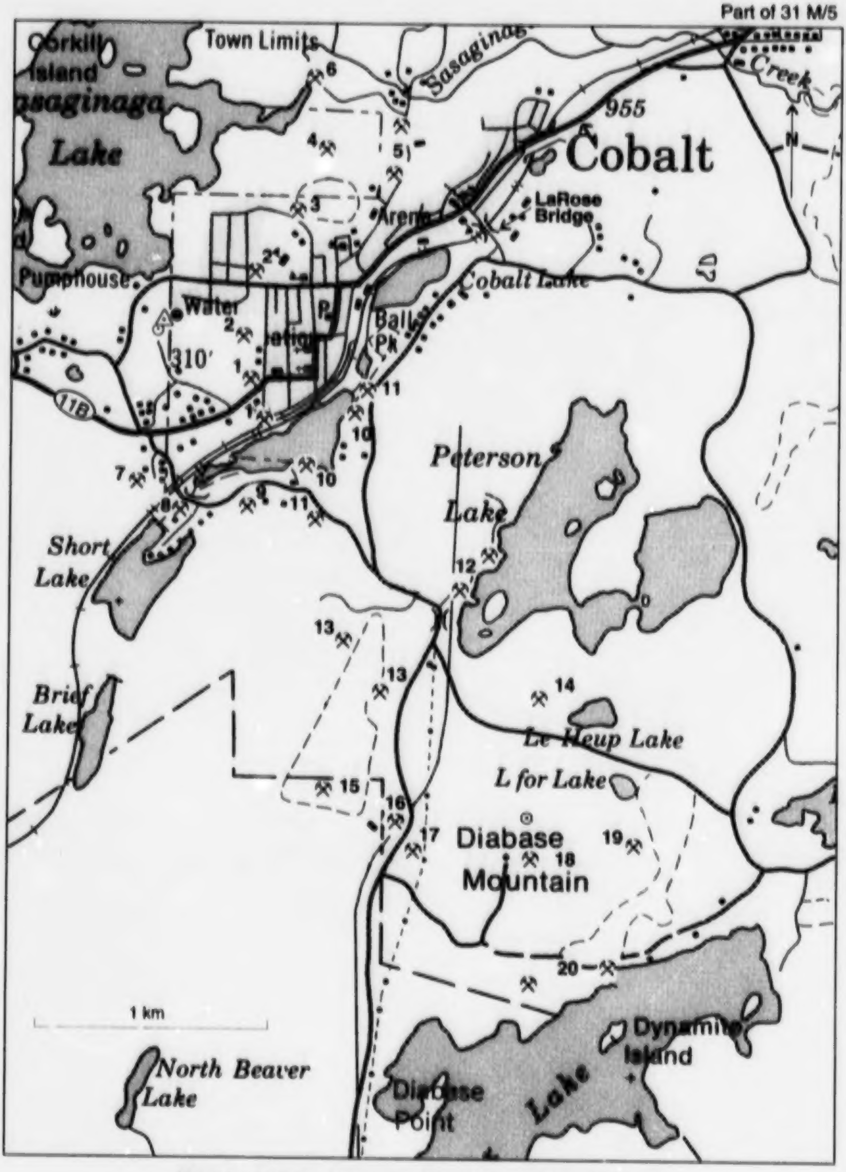
To reach the mine, follow the road leading north from Highway 11B at **km 6.05** (see road log on page 19). The main working (shaft No. 12) is 4.6 m north of Highway 11B, and others are within 244 m to the north and northwest of No. 12; all are on the west side of the road. Shaft No. 7 is reached by following the road leading west from the Townsite mine for 300 m. Across the road from shaft No. 12 is the City of Cobalt mine, which produced 435 442 000 g of silver and some cobalt between 1907 and 1932. See Map 3, No. 2, on page 21.

Refs.: 45 p. 12; 98 p. 132; 103a p. 66-70; 127 p. 20; 158 p. 124; 159 p. 155; 160 p. 141; 170 p. 94-95, 102; 199 p. 162-169.



Map 3. Cobalt, Coleman Road, Hound Chute Road

1. Townsite mine
2. Buffalo mine
3. Coniagas mine
4. Trethewey mine
5. Nipissing mine
6. Hudson Bay mine
7. Silver Queen mine
8. Princess mine
9. McKinley-Darragh mine
10. Cobalt Lake mine
11. Nipissing 404 mine
12. Peterson Lake mine
13. Seneca Superior mine
14. Nipissing 407 mine
15. Provincial mine
16. Savage mine
17. Mensilvo mine
18. Silverfields mine
19. Cobalt Central, Bailey mines
20. Hiho mine

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Coniagas mine

The headframe enclosed by a two-storey building opposite the Cobalt railway station is shaft No. 4 of the Coniagas mine; its workings extended to a depth of 114 m, the deepest on the claim, but it was much less productive than openings on other parts of the claim. The silver-bearing vein was discovered in an outcrop on the property. The vein was about 45 cm wide and composed of calcite containing slabs of native silver about 930 cm^2 with a thickness of 2 cm or more, together with large irregular knobs and masses of native silver. A shaft was sunk on the richest section of the vein. There are several shafts on the property; No. 2, reaching a depth of 87 m, was the most productive.

From 1905 to 1943, the deposit yielded close to 1 057 502 000 g of silver, some 8494 kg of cobalt, and a small amount of copper and nickel, making it one of the most productive mines in the Cobalt area. Chalcopyrite was associated with the silver-cobalt minerals.

Plate 2

Coniagas mine, 1972. The headframe has been enclosed within a two-storey building which houses the Fire Museum in Cobalt. (GSC 161463)

The deposit was discovered in 1904 by W.G. Trethewey on his second day of prospecting in Cobalt. Tretheway carried out the early work, then sold the claim to Coniagas Mines Limited, which operated it continuously until 1924 when a fire destroyed the concentrator (built in 1907) and shaft No. 2. The ore was shipped to the company's smelter in Thorold, Ontario, which was in operation from 1908 to 1926. Although most of the known ore was mined out, mining was carried out at intervals by various interests including Cobalt Properties Limited (1932-1937), Messrs. A. Murphy and A.P. Landry (1937-1943), and Sanymac Mining and Development Company Limited (1943). From 1974 to 1982, Agnico-Eagle Mines Limited operated the mine and produced 29 455 kg of silver and 24 278 kg of cobalt.

The mine is reached by proceeding west from the sharp bend on Highway 11B at **km 6.8** (see road log on page 19) for about 30 m to a junction; turn right (north) onto the road to Sasaginaga Lake and proceed 0.3 km to the mine on the right side of the road. See Map 3, No. 3, on page 21.

Refs.: 103a p. 82-86; 136 p. 209A; 155 p. 691; 170 p. 118-119; 199 p. 139-154.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Trethewey (New Ontario) mine

The rich silver vein that became the Trethewey mine was discovered in May 1904 by W.G. Trethewey on his second day of prospecting in the Cobalt area, the same day he found the adjacent Coniagas deposit. Mr. Trethewey worked his original discovery from 1904 to 1905, producing 12 469 876 g of silver and 16 535 kg of cobalt. Most of the subsequent work was done by Trethewey Silver Cobalt Mines Limited (1906-1920) and Coniagas Mines Limited (1920-1924). A concentrator operated at the mine site. Various companies operated the mine almost continuously until 1943. The workings consisted of six shafts reaching depths of 20 m to 62 m. Total production amounted to 225 697 986 g of silver and 97 937.7 kg of cobalt for a total value of $4 392 243.

The mine is located immediately north of the Coniagas mine. See Map 3, No. 4, on page 21.

Refs.: 103a p. 140-143; 126a p. 15, 25; 155 p. 691; 199 p. 133-139.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Nipissing mine

The Nipissing (RL400) mine was one of the most prolific producers of silver in the Cobalt area. One vein, the Meyer vein, yielded 404 339 000 g of silver, and an oreshoot 210 m long and 10 or 15 cm wide assayed 27 428 g/t to 34 285 g/t of silver. The ore consisted mainly of smaltite and native silver in pink calcite. During mining of vein 64, vugs were encountered in calcite; they were lined with calcite crystals studded with crystals of argentite, stephanite, and ruby silver. Galena, chalcopyrite, and hematite were reported from some veins. Marcasite concretions in carbonaceous sedimentary rock have been found in the dump of shaft No. 64.

Plate 3

Trethewey cobalt-silver vein at the discovery post, May 1904. The vein, up to 20 cm wide, was worked by an opencut, 15.2 m long and 5.6 m deep; in its first year of operation, hand-sorted ore valued at $200 000 was shipped. At that time, silver fetched 55 to 60 cents a Troy ounce (31.103 g) and cobalt sold for 65 cents a pound (4530 g). (GSC 201639)

Most of the production was from two shafts: No. 64 was sunk to a depth of 275 m, with a winze reaching a depth of 305 m from the surface, and No. 73 reached a depth of 100 m, with a winze extending to 167 m. Shaft No. 73 serviced three of the most productive veins including the outstanding Meyer vein; an aerial tram connected it with the Nipissing mill on claim 404 at the southeastern end of Cobalt Lake. Two additional shafts were used to hoist the ore.

The Meyer vein was discovered in 1907, and Nipissing Mines Company, Limited began work on it the same year. By the end of 1908, four shafts had been sunk on the property. Mining continued until 1932; fire destroyed the company's mill the following year. The location of the mines is shown on Map 3, No. 5, on page 21.

Road log from Highway 11B at **km 6.85** (see road log on page 19):

km	0	At bend on Highway 11B opposite Cobalt railway station, proceed straight ahead (north).
	0.15	Community Centre on left.

km	0.3	Turnoff (on left) to Nipissing mine southern workings. To reach them, turn left and proceed 0.8 km to a junction. Shaft No. 80 of the Nipissing mine is to the left of the junction; part of the Coniagas mine is straight ahead and up the ridge. To reach shaft No. 73 of the Nipissing mine, turn right at the junction and proceed about 150 m to the mine. The workings of the Trethewey mine are on the ridge above this shaft. To reach shaft No. 64 (Nipissing mine), continue straight ahead from km 0.3.
	0.6	Junction; turn left.
	0.8	Fork; bear right.
	0.9	Shaft No. 64 (Nipissing mine) on left.

Refs.: 38 p. 111-113; 103a p. 46-57; 126 p. 99-102; 199 p. 114-125; 226 p. 120-121.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Hudson Bay mine

This deposit was discovered by the Timiskaming and Hudson Bay Mining Company, Limited before the discovery of silver in the district. The company, incorporated in the spring of 1903 was formed by a group of pioneer New Liskeard residents including farmers, businessmen, and professional men for the purpose of prospecting in northern Ontario. Before the Cobalt rush, it had staked claims in the Boston Creek and Larder Lake areas. When news of the Cobalt discoveries broke out, the company turned its attention to that area and, in 1904, became the first incorporated company to stake claims in the Cobalt district. The rich veins on the Hudson Bay property were discovered in about 1906 and worked continuously until 1914, and again from 1916 to 1920. A concentrator was built in 1910. In 1909, the company's name was changed to Hudson Bay Mines, Limited. The mine was worked for short intervals by various companies from 1920 to 1953. Production to 1953 yielded about 202 169 500 g of silver, about 5238 kg of cobalt, and some nickel and copper. The mine consisted of two shafts and some open pits, one 12 m wide.

Massive pyrite and chalcopyrite are associated with silver minerals in the dumps. Secondary minerals that have formed coatings or crusts on the calcite include bright green brochantite and colourless to white finely granular and platy gypsum.

To reach the mine, follow the road log to the Trethewey mine. From shaft 64 (Trethewey mine), continue along the road for 215 m. The mine is to the right (north) of this point. See Map 3, No. 6, on page 21.

Refs.: 57 p. 2-3; 103a p. 142-144; 137 p. 65; 199 p. 125-133.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

M121

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Mines along Coleman Road and Hound Chute Road

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Coleman Road and Hound Chute Road (see road log on page 19):

km	**0**	Junction of Highway 11B and Coleman Road. This junction is 5.5 km north of the junction of highways 11 and 11B, south of Cobalt. The road log proceeds along the Coleman Road.
km	**0.25**	Silver Queen mine on right (page 26).
km	**0.4**	Trail on right to Princess mine (page 27).
km	**0.6**	McKinley-Darragh mine on right (page 27).
km	**0.9**	Junction, single-lane road on right to McKinley-Darragh mine, and to Cobalt Lake mine (page 27); opposite the junction are other workings of this mine.
km	**1.1**	Kendal shaft (Nipissing 404 mine) on right (page 32).
km	**1.2**	Junction, alternate single-lane road on right to McKinley-Darragh mine.
km	**1.4**	Junction, Hound Chute Road; proceed straight ahead.
km	**1.5**	Junction, road on right to Seneca Superior (Cart Lake) mine (page 28).
km	**1.75**	Junction, road on left to Peterson Lake mine (page 28).
km	**1.85**	Junction, road on left to Glen Lake and to Nipissing 407 mine (page 29), Cobalt Central mine and Bailey mine (page 29); the road log continues along Hound Chute Road.
km	**2.2**	Seneca Superior (Cart Lake) mine on right; the shaft between the lake and the road was sunk on the Worth vein (page 28).
km	**2.5**	Junction on right, single-lane road to Provincial mine (page 30).
km	**2.65**	From about this point, the road parallels the compressed air pipeline to Hound Chute.
km	**2.9**	Savage mine (page 31), Mensilvo mine (page 31); road on left leads to Silverfields mine (page 31), Hiho mine (page 32).

Silver Queen mine

Between 1905 and 1939, this mine produced nearly 15 551 500 g of silver and 76 104 kg of cobalt; its most productive years were from 1906 to 1909, the peak being in 1908 when nearly half the total silver and 80 per cent of the cobalt were produced. It was worked from an inclined shaft, about 61 m deep. The deposit was staked in 1904 by the Timiskaming and Hudson Bay Mining Company, the oldest mining company in the area, having been formed in 1903 before the discovery of silver. During its most productive years, the mine was operated by Cobalt Silver Queen Mining Company.

The mine and dumps are located at **km 0.25** on Coleman Road (see road log above). See Map 3, No. 7, on page 21.

Mines along Coleman Road and Hound Chute Road

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Coleman Road and Hound Chute Road (see road log on page 19):

km	0	Junction of Highway 11B and Coleman Road. This junction is 5.5 km north of the junction of highways 11 and 11B, south of Cobalt. The road log proceeds along the Coleman Road.
km	0.25	Silver Queen mine on right (page 26).
km	0.4	Trail on right to Princess mine (page 27).
km	0.6	McKinley-Darragh mine on right (page 27).
km	0.9	Junction, single-lane road on right to McKinley-Darragh mine, and to Cobalt Lake mine (page 27); opposite the junction are other workings of this mine.
km	1.1	Kendal shaft (Nipissing 404 mine) on right (page 32).
km	1.2	Junction, alternate single-lane road on right to McKinley-Darragh mine.
km	1.4	Junction, Hound Chute Road; proceed straight ahead.
km	1.5	Junction, road on right to Seneca Superior (Cart Lake) mine (page 28).
km	1.75	Junction, road on left to Peterson Lake mine (page 28).
km	1.85	Junction, road on left to Glen Lake and to Nipissing 407 mine (page 29), Cobalt Central mine and Bailey mine (page 29); the road log continues along Hound Chute Road.
km	2.2	Seneca Superior (Cart Lake) mine on right; the shaft between the lake and the road was sunk on the Worth vein (page 28).
km	2.5	Junction on right, single-lane road to Provincial mine (page 30).
km	2.65	From about this point, the road parallels the compressed air pipeline to Hound Chute.
km	2.9	Savage mine (page 31), Mensilvo mine (page 31); road on left leads to Silverfields mine (page 31), Hiho mine (page 32).

Silver Queen mine

Between 1905 and 1939, this mine produced nearly 15 551 500 g of silver and 76 104 kg of cobalt; its most productive years were from 1906 to 1909, the peak being in 1908 when nearly half the total silver and 80 per cent of the cobalt were produced. It was worked from an inclined shaft, about 61 m deep. The deposit was staked in 1904 by the Timiskaming and Hudson Bay Mining Company, the oldest mining company in the area, having been formed in 1903 before the discovery of silver. During its most productive years, the mine was operated by Cobalt Silver Queen Mining Company.

The mine and dumps are located at **km 0.25** on Coleman Road (see road log above). See Map 3, No. 7, on page 21.

Refs.: 103a p. 161; 197 p. 25-30.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Princess mine

During mining operations, striated rounded masses of smaltite up to 45 cm by 20 cm and abundant erythrite were encountered. The deposit was worked by a shaft to a depth of 70 m. Production began in 1907; the mine was operated by LaRose Consolidated Mines Limited from 1908 to 1923, and for a few years thereafter by McKinley-Darragh-Savage Mines of Cobalt Limited. To the end of 1922, the mine yielded 115 510 508 g of silver.

The mine is located about 100 m south of Coleman Road at **km 0.4** (see road log on page 26). See Map 3, No. 8, on page 21.

Refs.: 103a p. 97-99; 200 p. 105-106.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

McKinley-Darragh mine

This deposit was the first to be staked in the Cobalt area; the Discovery vein was staked at the south end of Cobalt Lake in August 1903 by James H. McKinley and Ernest F. Darragh. Between 1906 and 1922, nearly 622 060 000 g of silver were recovered by McKinley-Darragh-Savage Mines of Cobalt Limited; some production was derived from the recovery of native silver from gravels near the Discovery vein. A concentrator was built in 1907. Other companies involved in production were Mining Corporation of Canada Limited (1928 to 1932) and Cobalt Properties Limited (1934 to 1939).

The mine consisted of several shafts, the deepest being 137 m; they are located on both sides of Coleman Road between **km 0.6** and **km 0.9**, and along the loop road leading south from Coleman Road at **km 0.9** and returning at **km 1.2** (see road log on page 26). See Map 3, No. 9, on page 21.

Refs.: 103a p. 113-120; 200 p. 106-114.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Cobalt Lake mine

Shaft No. 6 of this inactive mine is located near the south shore of Cobalt Lake and about 30 m north of the McKinley-Darragh shaft at **km 0.9** on Coleman Road (see road log on page 26). Another of the Cobalt Lake mine shafts is on the east side of the lake about 300 m northeast of shaft No. 6. The veins serviced by both were located beneath the lake; mining was conducted by Cobalt Lake Mining Company Limited from 1906 to 1914, by Mining Corporation of Canada Limited from 1914 to 1932, and later by Cobalt Properties Limited and Silanco Mining and Refining Company Limited.

A mill was erected near shaft No. 6. In 1915 the lake level was lowered and in 1936 a dam was built across the lake to facilitate exploration and mining. The mine, an important producer of silver, yielded about 217 721 000 g of silver and some cobalt. In the 1950s, the Helens Mining and Reduction Company Limited built a cyanide mill for treatment of tailings dumped by various companies into the south end of Cobalt Lake; the mill is located near shaft No. 6 and is visible from Coleman Road at **km 1.0** (see road log on page 26). See Map 3, No. 10, on page 21.

Refs.: 170 p. 106-107; 200 p. 90-100.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Seneca Superior (Cart Lake) mine

In addition to silver-cobalt ore minerals common in the Cobalt deposits, maucherite was found in association with nickeline and breithauptite at this mine. The Kerry Mining Company carried out the original work on the property from 1906 to 1911. About 171 066 500 g of silver were produced from one oreshoot (Worth vein) between 1912 and 1916 by Seneca Superior Silver Mines Limited; the Worth vein proved to be one of the outstanding veins in the Cobalt camp. The ore was located beneath Cart Lake near the east shore and was mined from a 61 m shaft. Other shafts were sunk on the west side of the lake. The property was re-examined in the 1920s by Mining Corporation of Canada Limited and in the 1960s by Agnico Mines Limited; both companies removed some ore, the latter for treatment at the Penn mill. Operations ended in 1967.

Access to the west side of Cart Lake is by a road leading south from the Coleman-Hound Chute Road at **km 1.5**; the shaft from which the bulk of the ore was mined is near the shore of the lake at **km 2.2** (see road log on page 26). See Map 3, No. 13, on page 21. The workings immediately south of the Seneca Superior mine are those of the Gould mine, which produced some ore between 1913 and 1915.

Refs.: 103a p. 152-156; 142 p. 154; 161 p. 141; 162 p. 130; 200 p. 61-62, 68.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Peterson Lake mine

The mine consists of a number of shafts that were sunk along the western and northeastern shores of Peterson Lake and on two of the islands. Almost 31 103 000 g of silver and about 12 231 kg of cobalt were produced between 1908 and 1966. The Peterson Lake No. 1 shaft is located near the lakeshore and is reached by a road, 80 m long, leading north from the Coleman-Hound Chute Road at **km 1.75** (see road log on page 26). The shaft is 66 m deep and most of the dump has been removed. The underground workings extended beneath Peterson Lake. Original work on the property was done in 1906 by Peterson Lake Silver Cobalt Mining Company Limited. The property was subsequently leased by numerous companies and, in 1963, acquired by Silver Town Mines Limited. Other workings, not serviced by roads, are located along the lakeshore to the north of No. 1 shaft. See Map 3, No. 12, on page 21.

Refs.: 170 p. 186-187; 200 p. 57-70.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Nipissing 407 mine

Magnetite occurs in small amounts with silver-cobalt ore minerals. A small amount of ore was obtained between 1924 and 1926 from veins containing high-grade silver. The deposit was worked again by Agnico Mines Limited from 1963 to 1971, the ore being milled at the Penn mill. The company deepened the existing shaft from 105 m to 140 m.

The mine is located about 60 m north of the road to Glen Lake at a point 0.7 km east of its junction with the Coleman-Hound Chute Road. See Map 3, No. 14, on page 21.

Refs.: 146 p. 132; 156 p. 122-123; 157 p. 120; 200 p. 87-90; 253 p. 50.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Cobalt Central (Penn-Canadian) mine, Bailey mine

The silver-bearing veins in the adjoining Cobalt Central and Bailey mines were discovered in about 1905. The orebody lies beneath Diabase Mountain, a prominent hill (378 m above sea level) composed of Nipissing diabase on the west side of Glen Lake. The Cobalt Central mine is the more northerly one; it was first worked by Big Pete Canadian Mines Limited (1905) and by

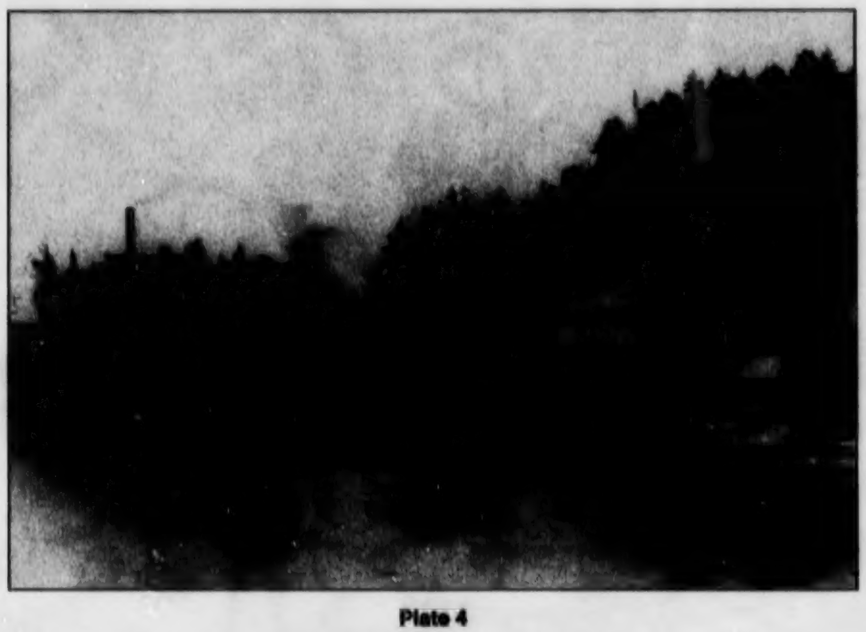

Plate 4

Cobalt Central mine, 1908. (H.H. Harrison/National Archives of Canada C179)

Cobalt Central Mines Company (1906-1908), which also installed a concentrating plant. Penn-Canadian Mines Limited operated the mine from 1908 to 1919 from two shafts, one (to a depth of 94.5 m) on the west side of Glen Lake, the other (to a depth of 33.5 m) 75 m north of the lake. The mine produced nearly 116 636 450 g of silver to 1921; since then, operations have been carried out at intervals by various companies. From 1968 to 1971, it was operated by Agnico Mines Limited.

The Bailey mine was originally worked by Bailey Cobalt Mines Limited between 1906 and 1921. The underground workings were investigated in 1951-1952 by New Bailey Mines Limited, and a minor amount of production was obtained. Recent operations were conducted by Glen Lake Silver Mines Limited (1961 to 1969), Agnico Mines Limited (1970 to 1971), Silver Shield Mines Incorporated (1971, 1972), and Canadaka Mines Limited (1973-1981). The mine consists of two shafts 86 m and 139 m deep respectively, an adit 168 m long, and a mill. It produced nearly 93 309 000 g of silver from 1912 to 1966. See Map 3, No. 19, on page 21.

Road log to Nipissing 407, Cobalt Central, and Bailey mines from **km 1.85** on the Coleman-Hound Chute Road (see road log on page 26):

km	0	Proceed onto road to Glen Lake.
	0.05	Cobalt conglomerate outcrops on right.
	0.7	Turnoff (left) to Nipissing 407 mine.
	1.2	Junction, road to Cobalt Central and Bailey mines. Turn right.
	1.6	Cobalt Central and Bailey mines.

Refs.: 103a p. 156-157, 172; 120 p. 92-95; 161 p. 105, 108-109; 162 p. 104-105, 108-109; 170 p. 160-161, 184-185; 251 p. 301-302; 253 p. 50, 51.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Provincial mine

Sheets and nuggets of native silver were associated with smaltite and nickeline in a vein discovered in 1906 by Thor Brown and G.R. McLaren, students prospecting under the direction of Willet G. Miller, provincial geologist. The discovery was made in the Gillies timber limit, a 259 km^2 tract of pine-covered land on both sides of the Montreal River where mining activity was prohibited due to the danger of forest fires. The Ontario government removed the restrictions following the rich silver discoveries in adjacent Coleman Township, undertook prospecting within the timber limits, and located the ore.

The Ontario government explored the deposit using two shafts. The results at depth were disappointing and, in 1909, the government terminated the operation having made a profit of $34 094 on its only mining venture. The Cobalt Provincial Mining Company Limited worked the deposit until 1913, and subsequently various companies were involved in its operations at various times. Production to 1940 netted some 8 926 561 g of silver and 24 462 kg of cobalt. The main shaft was sunk to a depth of 110 m, a second one to 33 m. From 1965 to 1968, Sudbury Contact Mines Limited operated the mine and produced some silver.

The mine is located south of Cart Lake; see Map 3, No. 15, on page 21. Access is by a road, 0.4 km long, leading west from the Coleman-Hound Chute Road at **km 1.85** (see road log on page 26).

Refs.: 60 p. 8-10; 103a p. 172-174; 155 p. 692; 158 p. 141; 159 p. 165; 160 p. 153; 161 p. 121; 201 p. 96-99.

Maps (T): 31 M/5 Cobalt
(G): 2051 Cobalt silver area, southwestern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Savage mine, Mensilvo mine

The Savage and Mensilvo (Silver Bar) deposits were discovered in 1905 and are located along the Coleman-Hound Chute road at **km 2.9** (see road log on page 26), the Savage mine being the more northerly. The Savage mine produced mainly silver whereas the Mensilvo mine produced cobalt along with silver and some nickel and copper. In addition to silver, cobalt, and nickel minerals, the deposits contain chalcopyrite, sphalerite, and galena. Both mines consist of a number of shafts from 12 m to 88 m deep; their underground workings are connected.

Original work on the Savage mine was performed between 1909 and 1928 by McKinley-Darragh-Savage Mines of Cobalt, Limited. Subsequent operations were conducted at intervals by various operators until the 1960s when Silver Summit Mines Limited dewatered the mine and brought it back into production for a few years.

The Mensilvo mine was first worked by Silver Bar Mining Company Limited between 1905 and 1909, after which intermittent operations were conducted by several companies, including Mensilvo Mines Limited (1946 to 1954) and Silver Crater Mines Limited (1954 to 1956). From 1961 to 1962, it was worked by Mr. J.J. Gray of Toronto. In 1962, Silver Summit Mines Limited acquired the property and worked it in conjunction with its adjoining Savage mine until 1967; the company installed a crushing and milling plant and several mine buildings to service both mines.

Most of the mine workings are located on the east side of the Coleman-Hound Chute road at **km 2.9** (see road log on page 26). See Map 3, No. 16 and No. 17, on page 21.

Refs.: 97 p. 125-126; 98 p. 140-141; 103a p. 120-121; 156 p. 143-144; 157 p. 138-139; 158 p. 138-139; 159 p. 160-161; 160 p. 147-148; 201 p. 86-96.

Maps (T): 31 M/5 Cobalt
(G): 2051 Cobalt silver area, southwestern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Silverfields (Alexandra) mine

Some minerals not commonly found in cobalt ores were identified from the Silverfields deposit. Included are: pararammelsbergite; proustite closely associated with tetrahedrite, stephanite, and pyrrhotite; ullmannite associated with tetrahedrite, pyrargyrite, and proustite; matildite, as grains and lamellae in galena; bravoite associated with pyrite; smythite associated with pyrrhotite, galena, sphalerite, chalcopyrite, and marcasite. These uncommon minerals are visible under magnification. Pebbles of massive sulphides (chalcopyrite, pyrrhotite, pyrite, sphalerite, galena, arsenopyrite, and freibergite) up to 5 cm in diameter occur in the conglomerate.

The Silverfields (Alexandra) mine is located on the south slope of Diabase Mountain. A 94.5 m shaft was sunk on the property in 1909 and some development work was done during the next 10 years. In 1962, Silverfields Mining Corporation Limited acquired the property and began preparations for mining from the old shaft. Mine buildings were erected and equipment installed. The shaft was deepened to 132 m in 1963 and to 158 m by 1970. The mill commenced operations in 1966; before then, the ore had been milled at the Agnico Mines Limited Penn mill.

Silver, cobalt, and some copper were produced. Teck Corporation Limited acquired the property in 1971 and operated it until 1983. Production from 1964 to 1983 amounted to 574 863 561 g of silver. See Map 3, No. 18, on page 21.

Road log to Silverfields mine from **km 2.9** on the Coleman-Hound Chute road (see road log on page 26):

km	0	Junction; follow road on left proceeding east.
	0.9	Junction; turn left and follow steep road up Diabase Mountain. (Road straight ahead leads to Hiho mine.)
	1.3	Silverfields mine.

Refs.: 98 p. 137; 120 p. 98-99; 146 p. 136; 142 p. 162, 185; 144 p. 214, 216, 223, 225; 156 p. 139-140; 157 p. 126-128; 158 p. 135-136; 159 p. 157-158; 160 p. 143-144; 161 p. 109; 162 p. 114-115; 201 p. 83-86; 251 p. 300, 318.

Maps (T): 31 M/5 Cobalt
(G): 2051 Cobalt silver area, southwestern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Hiho (University, Cleopatra) mine

The mine consists of the University No. 3 and Cleopatra workings with shafts to depths of 91 m in the former and 74 m in the latter. High grade silver ore was encountered in recent operations at the University No. 3 shaft; the vein extended beneath Giroux Lake. Native silver and ruby silver were found in wall rock adjacent to the vein. Leaf silver has been reported from veins that also contained minor amounts of galena, sphalerite, and chalcopyrite.

The deposit was worked intermittently from 1905, when it was discovered, to 1970. Operators included University Mines Limited, Cleopatra Mining Company Limited, LaRose Mines Limited, LaRose-Rouyn Mines Limited, Silver-Miller Mines Limited, and more recently, Hiho Silver Mines Limited, which produced silver, cobalt, and minor amounts of nickel and copper between 1963 and 1971. The ore was treated at the Glen Lake Silver Mines Limited mill.

The mine is located on the north shore of Giroux Lake. Access is via the road to the Silverfields mine; at the junction at **km 0.9** continue straight ahead for 0.25 km to the Hiho mine. See Map 3, No. 20, on page 21.

Refs.: 120 p. 96-97; 156 p. 129-130; 157 p. 126-128; 158 p. 129-130; 159 p. 150; 160 p. 137-138; 161 p. 114-115; 162 p. 109-111; 201 p. 73-79, 105-106; 253 p. 51.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Nipissing 404 mine

During mining operations, crystals of cobaltite 12 mm in diameter were reported to be abundant in vein 8 (near Peterson Lake), and dyscrasite was found to be particularly abundant in vein 19. Secondary minerals associated with ore minerals included erythrite, annabergite, heterogenite, asbolite, and a black oxidation product of silver referred to as "buttermilk silver" by miners. Chalcopyrite, pyrrhotite, pyrite, galena, and sphalerite have also been found.

The discovery of a silver-bearing vein on this property on October 22, 1903 by Tom Hebert was the third silver discovery recorded in the Cobalt district. The discovery vein outcropped on the cliff of an 18 m knoll at the base of which were strewn lumps of native silver fallen from the weathered vein. The Nipissing Mining Company Limited was formed in 1904 to explore and develop the property; it operated continuously until 1932. Since then, mining has been carried out at intervals. The company became Nipissing-O'Brien Mines Limited in 1952 and was acquired by Agnico Mines Limited in 1958. Chitaroni Minerals Limited leased and worked some of the old shafts in 1964 and treated the ore at the Deer Horn Mines Limited O'Brien mill.

The mine has been worked by numerous opencuts and shafts, and by a 549 m adit at the shore of Cobalt Lake, just south of shaft No. 81. The workings are in the area extending from the east side of the south half of Cobalt Lake to Peterson Lake. One of the most productive shafts, the Kendall shaft, is located next to the McKinley-Darragh mine, about 30 m west of Coleman Road at **km 1.1** (see road log on page 26) and was used to service the discovery vein. Two mills were erected on the site.

Access to the mine is via Hound Chute Road. See Map 3, No. 11, on page 21.

Road log to Nipissing 404 mine from **km 7.4** on Highway 11B (see road log on page 26):

km	0	Turn right (east) and proceed across LaRose bridge.
	0.15	Turnoff to LaRose mine and LaRose cabin on left; continue straight ahead.
	0.25	Junction, Hound Chute Road; turn right.
	0.4	Turnoff (right) to Right of Way mine; continue straight ahead.
	0.9	Road on left leads to the Nipissing 404 mine shafts and mill site; to reach other workings of this mine continue straight ahead.
	1.05	Shaft No. 2 is at base of ridge on right.
	1.2	Shaft No. 81 is on right.
	1.6	Road on left leads to several shafts on Nipissing Hill, and continues east to Peterson Lake and shafts No. 12 and No. 8.
	1.9	Junction, Coleman Road. To reach the Kendall shaft, turn left and proceed 0.4 km to the mine on the left side of the road.

Refs.: 45 p. 9-10; 103a p. 44, 57-62; 155 p. 689; 157 p. 123; 158 p. 125; 160 p. 132, 134; 161 p. 104-105, 106; 200 p. 73-87.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

IMPORTANT NOTE CONCERNING THE FOLLOWING PAGES

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Mines along Brady Lake Road

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Brady Lake Road:

km	0	Highway 11B at the turnoff to LaRose bridge; proceed towards the bridge.
km	0.1	LaRose bridge. The Right of Way (North) mine (page 35) is on the south side of the bridge.
km	0.15	Turnoff (left) to LaRose mine (page 37).
km	0.25	Junction, Hound Chute Road; continue straight ahead.
km	0.3	Chambers-Ferland (Aladdin) mine (page 39).
km	0.4	Turnoff (right) to Nipissing 401 mine (page 39).
km	0.6	Turnoff (right) to O'Brien mine (Shaft 33) (page 40).
km	0.8	Turnoff (left) to O'Brien mine (page 40).
km	1.2	Junction, road on left leading to Cross Lake Road and to Violet mine (page 40). The Cobalt-Brady Lake road continues on right.
km	1.4	Turnoff (left) to Colonial mine (page 41).
km	2.4	Nova Scotia mine on left (page 41), Peterson Lake on right.
km	3.0	Juno mine on right (page 42).
km	3.8	Junction, road to Glen Lake on right. Continue straight ahead.
km	4.0	Turnoff (left) to Crown Reserve mine (page 42).
km	4.1	Junction, road on right leads to Foster mine (page 43). Dump at junction is that of the Lawson mine (page 43). The Coniail mine is about 480 m south of this junction (page 43).
km	4.3	Trench (on left) is the site of an extremely rich silver-bearing vein mined in the early days; it was referred to as the "Silver Sidewalk", and was part of the Lawson mine. The trench is 5.5 m deep.
km	4.5	Turnoff (right and left) to Kerr Lake mine (page 44).
km	4.8	Turnoff (left) to Drummond mine (page 45).
km	5.0	Hargrave mine (page 45).
km	6.3	Turnoff (right) to Rochester mine (page 45).
km	6.6	Junction, road on left leads to Beaver (page 46), Timiskaming (page 46), and Cochrane mines (page 47).
km	6.7	Lumsden mine on right (page 47).
km	6.8	Turnoff (left) to the Silver-Miller Brady Lake mill site.

km	7.2	Junction at south end of Brady Lake; road on right leads to the Silver-Miller (page 48), Christopher (page 48), and Victory mines (page 49), and road on left leads to the Cobalt Lode mine (page 50). Both roads lead to the Ophir and Mayfair mines (page 51).

Right of Way (North) mine

The rusty headframe at the railway tracks on the south side of the LaRose bridge at **km 0.1** (see road log on page 34) is that of shaft No. 2 of the Right of Way mine. The property consisted of a strip 30 m wide straddling the Ontario Northland railway from Cobalt Lake northward for about 1500 m. It was operated by Right of Way Mines Limited between 1906 and 1919, the most productive period being prior to 1909.

The mine was developed by two shafts, one 21 m deep opposite the LaRose mine adit, the other below and south of the LaRose bridge; the underground workings of the latter extended to 164 m and were used for exploration and mining of adjoining properties. The mine produced 87 088 400 g of silver and 18 120 kg of cobalt, and is located on the south side of the LaRose bridge (**km 0.1**, see road log on page 34). See Map 4, No. 1, on page 36.

Refs.: 170 p. 198-199; 199 p. 104-111.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Plate 5

Right of Way mine, 1972. The Ontario Northland Railway (foreground) was formerly called the Temiskaming and Northern Ontario Railway. Its construction coincided with the discovery of silver and gold in northern Ontario; many of its employees became part-time prospectors whose efforts were rewarded with the discovery of a number of deposits. (GSC 161469)

Mines along Brady Lake Road

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Brady Lake Road:

km	**0**	**Highway 11B at the turnoff to LaRose bridge; proceed towards the bridge.**
km	**0.1**	**LaRose bridge. The Right of Way (North) mine (page 35) is on the south side of the bridge.**
km	**0.15**	**Turnoff (left) to LaRose mine (page 37).**
km	**0.25**	**Junction, Hound Chute Road; continue straight ahead.**
km	**0.3**	**Chambers-Ferland (Aladdin) mine (page 39).**
km	**0.4**	**Turnoff (right) to Nipissing 401 mine (page 39).**
km	**0.6**	**Turnoff (right) to O'Brien mine (Shaft 33) (page 40).**
km	**0.8**	**Turnoff (left) to O'Brien mine (page 40).**
km	**1.2**	**Junction, road on left leading to Cross Lake Road and to Violet mine (page 40). The Cobalt-Brady Lake road continues on right.**
km	**1.4**	**Turnoff (left) to Colonial mine (page 41).**
km	**2.4**	**Nova Scotia mine on left (page 41), Peterson Lake on right.**
km	**3.0**	**Juno mine on right (page 42).**
km	**3.8**	**Junction, road to Glen Lake on right. Continue straight ahead.**
km	**4.0**	**Turnoff (left) to Crown Reserve mine (page 42).**
km	**4.1**	**Junction, road on right leads to Foster mine (page 43). Dump at junction is that of the Lawson mine (page 43). The Conisil mine is about 480 m south of this junction (page 43).**
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km	**6.8**	**Turnoff (left) to the Silver-Miller Brady Lake mill site.**

km	**7.2**	**Junction at south end of Brady Lake; road on right leads to the Silver-Miller (page 48), Christopher (page 48), and Victory mines (page 49), and road on left leads to the Cobalt Lode mine (page 50). Both roads lead to the Ophir and Mayfair mines (page 51).**

Right of Way (North) mine

The rusty headframe at the railway tracks on the south side of the LaRose bridge at **km 0.1** (see road log on page 34) is that of shaft No. 2 of the Right of Way mine. The property consisted of a strip 30 m wide straddling the Ontario Northland railway from Cobalt Lake northward for about 1500 m. It was operated by Right of Way Mines Limited between 1906 and 1919, the most productive period being prior to 1909.

The mine was developed by two shafts, one 21 m deep opposite the LaRose mine adit, the other below and south of the LaRose bridge; the underground workings of the latter extended to 164 m and were used for exploration and mining of adjoining properties. The mine produced 87 088 400 g of silver and 18 120 kg of cobalt, and is located on the south side of the LaRose bridge (**km 0.1**, see road log on page 34). See Map 4, No. 1, on page 36.

Refs.: 170 p. 198-199; 199 p. 104-111.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

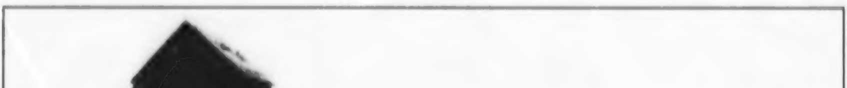
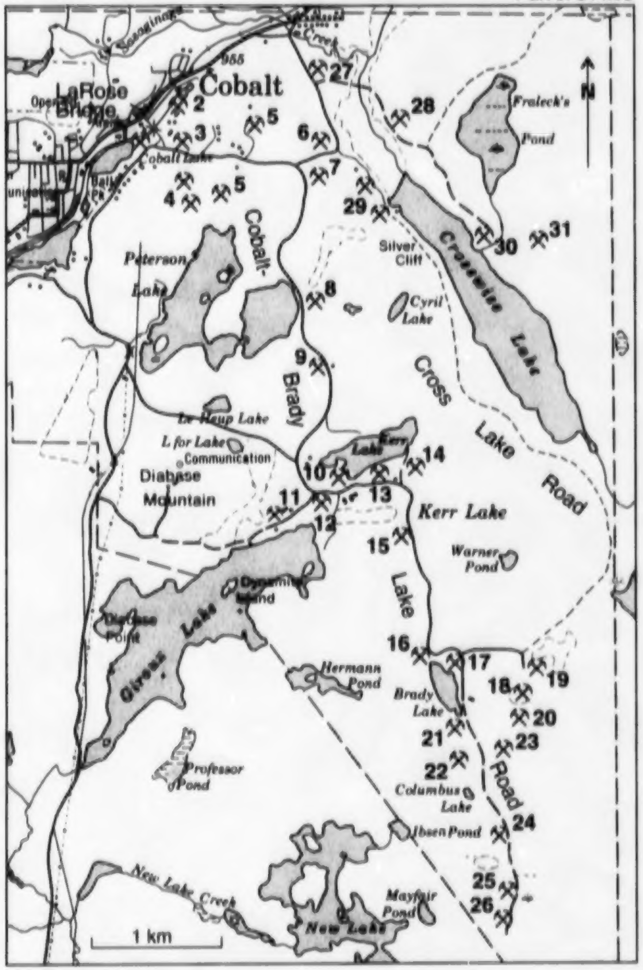


Plate 5

Right of Way mine, 1972. The Ontario Northland Railway (foreground) was formerly called the Temiskaming and Northern Ontario Railway. Its construction coincided with the discovery of silver and gold in northern Ontario; many of its employees became part-time prospectors whose efforts were rewarded with the discovery of a number of deposits. (GSC 161469)

Part of 31 M/5



Map 4. Brady Lake Road, Cross Lake Road

1. Right of Way mine
2. LaRose mine
3. Chambers-Ferland mine
4. Nipissing 401 mine
5. O'Brien mine
6. Violet mine
7. Colonial mine
8. Nova Scotia mine
9. Juno mine
10. Crown Reserve mine
11. Foster mine
12. Lawson, Conisil mines
13. Kerr Lake mine
14. Drummond mine
15. Hargrave mine
16. Rochester mine
17. Lumsden mine
18. Timiskaming mine
19. Beaver mine
20. Cochrane mine
21. Silver Miller mine
22. Christopher mine
23. Cobalt Lode mine
24. Victory mine
25. Ophir mine
26. Mayfair mine
27. Mentor mine
28. Nerlip mine
29. Silver Cliff mine
30. Deer Horn mine
31. Smith Cobalt mine

LaRose mine

The second application for claims in the Cobalt area was made jointly in September 1903 by Fred LaRose, a Hull (Quebec) blacksmith employed in railway construction in Cobalt, and Duncan McMartin, his foreman; the discovery of 'float' and a vein was made by LaRose opposite Station 113 on the Timiskaming and Northern Ontario railway (now the Ontario Northland railway) about 395 m from Long (Cobalt) Lake. After exposing the vein by an opencut, LaRose learned from Ontario Bureau of Mines geologist W.G. Miller that the ore was silver; however in registering the claim, he specified copper as the discovery, mistaking the ore for nickeline. He sold his share of the claims to the newly formed LaRose Mines Limited for $30 000. The mine became one of the main producers of silver (about 543 679 724 g) and a substantial producer of cobalt (about 90 600 kg). Over 31 103 000 g of silver were won from one spectacularly rich vein mined from an opencut; the vein averaged 171 425 g/t. One oreshoot 259 m long averaged 29 142 g/t of silver and, in places, assayed up to 479 990 g/t. Early in 1906, a mass of silver ore weighing 181 kg was removed from the 65 m level. In addition to silver-cobalt minerals, chalcopyrite, galena, sphalerite, pyrrhotite, and pyrite were present in the orebody, and after silver and cobalt mining had ceased, chalcopyrite was mined as a copper ore. Rare minerals identified from the deposit include xanthoconite (hemispherical radiating aggregates of tiny crystals associated with proustite), pyrargyrite, and breithauptite.

The mine was developed by several opencuts and adits on the west side of a cliff facing the railway, and by several shafts. A depth of 203 m was reached from the Main shaft, the workings extending beneath the railway tracks. Mine operations were regarded as being exceptionally profitable until 1914; production decreased over the next 10 years, and a cavein flooded the mine in 1924. Small-scale leasing operations were conducted until 1949 when Silver-Miller Mines Limited began exploration work. A concentrator was put into operation in 1952, and

Plate 6

LaRose mine, 1905. (GSC 1993-298)

cobalt and less important amounts of silver were produced. In 1957 only copper was produced. Operations have since ceased and the mill has been used to treat ore from other properties of the company. The opencut on the south side of the Silver-Miller shaft marks the site of the main LaRose vein.

The mine is located on the east side of the railway and to the north of the LaRose bridge at **km 0.15** (see road log on page 34). See Map 4, No. 2, on page 36.

Refs.: 45 p. 9; 46 p. 36-37; 103a p. 93-95; 127 p. 15, 25; 144 p. 213; 155 p. 689; 170 p. 147;

199 p. 79-95; 215a p. 200.

Maps (T): 31 M/5 Cobalt

(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Plate 7

Fred LaRose at his cabin, 1907. LaRose is an Ottawa Valley miner and blacksmith who went to northern Ontario to work in building the Timiskaming and Northern Ontario Railway. He became one of the original discoverers of silver-cobalt ore in the Cobalt camp. (Archives of Ontario S18185)

Plate 8

LaRose mine, 1972. Cobalt conglomerate is exposed along the ridge behind the mine. (GSC 161468)

Chambers-Ferland (Aladdin) mine

The ore consisted of native silver and smaltite in calcite veins in Cobalt sediments and associated chert. Chalcopyrite, pyrite, and breithauptite occurred in chert.

The deposit was operated by Chambers-Ferland Mining Company Limited (1908-1912), Aladdin Cobalt Company Limited (1912-1919), Kirkland Lake Proprietary Limited (1919-1924), and Silver Miller Mines Limited (1953-1958). The workings consisted of three shafts with depths of 100.6 m, 30.5 m, and 19 m respectively. Production amounted to 63 139 090 g of silver.

The mine is located on the north side of Brady Lake Road at **km 0.3** (see road log on page 34). See Map 4, No. 3, on page 36.

Refs.: 103a p. 161-165; 170 p. 96; 199 p. 66-79.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Nipissing 401 mine

This property, operated until 1932 by Nipissing Mines Company Limited, is located immediately north of the company's 404 claim. It was one of their highly productive claims and was worked from three shafts, one near the east side of Cobalt Lake and two south of the Cobalt-Brady Lake Road. Access to the latter is by a single-lane road leading south from **km 0.4** on the

Cobalt-Brady Lake Road; shaft 127 is on the west side of the access road at a point 0.15 km from the Cobalt-Brady Lake Road, and shaft 10 is 0.25 km further south (see road log on page 34). See Map 4, No. 4, on page 36.

Some silver was obtained by using a putty-knife to scrape black secondary silver that formed a coating on fracture surfaces; this ore assayed up to about 34 285 g/t of silver and was referred to as "buttermilk silver" by the miners.

Ref.: 199 p. 95-104.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

O'Brien mine

This mine was the longest continuously operated mine in the Cobalt area. M.J. O'Brien Limited commenced operations in 1905, two years after the discovery of the silver-bearing vein by Neil King who was employed in construction of the railway; the Main shaft was sunk on the discovery vein. Except for a two-year (1905-1907) interruption due to litigation proceedings, operations were carried on continuously until 1937. Operations were conducted intermittently through leases, until 1952 when the company amalgamated with Nipissing Mines Company Limited and became Nipissing-O'Brien Mines Limited. Mining continued until 1958 when Agnico Mines Limited acquired the property, which it worked until 1967. The mine consists of several shafts with the Main shaft reaching a depth of 105 m.

This mine was regarded as one of the great mines of the Cobalt camp. It produced mostly silver (about 1 244 000 000 g) with an important amount of cobalt and some nickel and copper. Galena, chalcopyrite, pyrite, and nickeline occur in calcite in the mine dumps; the calcite fluoresces a vivid pink when exposed to ultraviolet rays, the 'short' rays being more effective than the 'long'. Some epidote occurs in calcite. Uncommon minerals have been reported from the deposit, including stromeyerite, wittichenite, and a mineral belonging to the polybasite-pearceite series. Crystals of galena (octahedrons 6 cm across), cobaltite, and polybasite have also been reported.

Most workings are located north of the Cobalt-Brady Lake road and are accessible via the road leading north from **km 0.8**. Shaft 33 is 0.3 km south by road from **km 0.6** (see road log on page 34). See Map 4, No. 5, page 36.

Refs.: 45 p. 10; 49 p. 208, 227, 234-236; 103a p. 121-128; 144 p. 206, 207, 208; 160 p. 130-131; 199 p. 58-66.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Violet mine

This former silver producer lies immediately east of the O'Brien mine; one of its shafts that had been worked since 1917 became the property of O'Brien Mines Limited in 1922 as a result of a lawsuit. The deposit was discovered in 1905 by a Mr. Handy and was initially worked by Violet Mining Company. LaRose Consolidated Mines Limited operated the mine from about 1908 to 1925

and sank a new shaft in 1922 following the loss of one of its shafts in litigation proceedings. Silanco Mining and Refining Company Limited worked the mine in 1951-1952 and Agnico Mines Limited, in 1963-1964.

The New Violet shaft is on the north side of the road leading east from **km 1.2** (see road log on page 34) on Brady Lake Road, at a point 0.15 km from the junction; the Violet-O'Brien shaft is higher up the ridge, about 140 m northwest of the New Violet shaft. See Map 4, No. 6, on page 36.

Refs.: 156 p. 121; 157 p. 119; 199 p. 19-27.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Colonial mine

About 38 878 750 g of silver and a small amount of cobalt were produced from this mine between 1907 and 1937. The deposit, discovered in 1904 by Murdoch (Murty) McLeod and George Glendenning, was originally worked by Colonial Mining Company Limited (1906-1914), and later by Menago Mining Company Limited (1922-1926). Subsequently, small yields were obtained by various companies including Silanco Mining and Refining Company Limited (1950-1954). The mill, erected in 1909, was operated for some years after 1954 by Coballoy Mines and Refiners Limited.

The workings, consisting of several opencuts, adits, and shafts, and the mill site are located on the north side of a ridge. Underground workings from one shaft reach a depth of 330 m, about the deepest of any mine in the Cobalt area. The most productive veins were, however, mined from adits.

The mine is situated on the north side of Brady Lake Road at **km 1.4** (see road log on page 34). See Map 4, No. 7, on page 36.

Refs: 57 p. 32, 199 p. 33-44.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Nova Scotia mine

One of the earliest openings on this property was an opencut in a spectacular surface vein showing native silver in place over 18 to 23 m. Leaf silver was commonly encountered in other veins and in diabase, during mining operations. The deposit, which produced about 31 000 000 g of silver, approximately 2830 kg of cobalt, and a little gold, was worked by several shafts (the deepest being 76 m) and opencuts; it was discovered in 1904 by J.B. Woodworth and Murdoch McLeod. The original operator, from 1906 to 1912, was Nova Scotia Silver- Cobalt Mining Company Limited; it erected a concentrating mill which was later used to treat ores from other mines. After 1912, the mine was worked intermittently by other operators until about 1957.

Galena, chalcopyrite, and pyrite were associated with silver and cobalt minerals. Specimens encrusted with secondary minerals are found in the dumps; these minerals include yellowish-brown earthy jarosite, bright-green brochantite and paratacamite, and erythrite. Specimens of white calcite from the dumps fluoresce pink when exposed to long ultraviolet rays.

The mine is located at **km 2.4** (see road log on page 34) on Brady Lake Road. See Map 4, No. 8, on page 36.

Refs.: 45 p. 13, 59, 60; 57 p. 25, 32; 200 p. 38-44.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Juno Reliance mine

The Juno mine, at **km 3.0** on Brady Lake Road (see road log on page 34), yielded about 1 430 700 g of silver between 1918 and 1922. Production was from a 69 m shaft. The early work was done by various companies; Juno Metals Corporation worked the mine between 1952 and 1955.

Minerals associated with ore minerals included galena, chalcopyrite, sphalerite, and pyrite. Amphibole asbestos has been reported. See Map 4, No. 9, on page 36.

Ref.: 200 p. 47-51.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Crown Reserve mine

This was one of the largest silver producers in the district; from 1908 to 1948, about 632 168 475 g of silver and over 14 950 kg of cobalt were won. An outstanding vein – the Carson vein – yielded 283 037.3 kg of high grade silver ore from a section 87 m long and 46 m deep, for an average of 6749 g of silver per 0.093 m^2 of vein area; one part of the vein was 84 cm wide and contained approximately 411 420 g/t of silver. Three other veins produced over 62 000 000 g of silver.

Since the deposit was located beneath the bed of Kerr Lake, lowering and subsequently dewatering of the lake were necessary prior to mining operations; dewatering was accomplished from 1913 to 1915 in a joint venture by Crown Reserve Mining Company Limited, owner of the property, and Kerr Lake Mining Company Limited, owner of the adjoining property to the south. In 1908, Crown Reserve Company began mining the Carson vein at the western end of the claim; the vein extended into the adjoining Silver Leaf property where it was discovered in 1907. The Crown Reserve Company worked its property until 1921 and leased and operated the Silver Leaf mine from 1909 to 1919. Intermittent operations were conducted by various companies until 1955, after which the lake was allowed to flood. Between 1967 and 1970, Hiho Silver Mines Limited drained the lake and kept it dewatered in order to rework the dumps of the Crown Reserve mine and those of the Kerr Lake mine, both of which rested on the lakebed. The mine consists of two shafts whose underground workings reach depths of 140 m and 244 m respectively.

The mine is located north of Brady Lake Road, and the turnoff to it is at **km 4.0** (see road log on page 34). See Map 4, No. 10, on page 36.

Refs.: 45 p. 24-26; 103a p. 101-113; 120 p. 97; 160 p. 138-139; 161 p. 110; 162 p. 110-111; 201 p. 39-44, 51.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Foster mine

Native silver and smaltite were the chief ore minerals at this mine; base metal minerals including sphalerite, galena, chalcopyrite, pyrite, and pyrrhotite were associated with the silver minerals. Several uncommon minerals have been reported including chalcocite, stromeyerite, bornite, polybasite, mckinstryite, and larosite; they occur as microscopic intergrowths with other metallic minerals. Mckinstryite and larosite are new minerals first identified from this mine.

The silver-bearing vein was discovered in 1905 by Albert Foster and his son Clement, a mining engineer who was one of the first people from outside the Cobalt district to prospect the area. He began prospecting the district in 1904. The Foster Cobalt Mining Company Limited began mining operations in 1906, and from 1909 to 1953 the property was leased and worked intermittently by several companies. In 1951, exploration was directed to the search for base metal minerals and a mill was erected to treat the ore; results proved to be uneconomic and the project was abandoned in 1952. The property was acquired in 1953 by Cobalt Consolidated Mining Corporation Limited, which was reorganized in 1957 and re-named Agnico Mines Limited; the mine was operated until 1960.

The Penn mill, used for treatment of silver-cobalt-nickel ores from several mines in the area, has operated since 1957; it has the largest capacity of any mill in the Cobalt area.

From 1951 to 1956, the Foster mine produced a little over 31 000 000 g of silver, about 226 000 kg of cobalt, and some nickel and copper. The main shaft is 67 m deep and produced most of the metal. Several other shafts and an adit were used in the early days.

The mine is located between Glen and Giroux lakes, about 0.3 km from the turnoff at **km 4.1** (see road log on page 34), on Brady Lake Road. See Map 4, No. 11, on page 36.

Refs.: 45 p. 13; 96 p. 111-112; 144 p. 201, 203-209; 170 p. 132-133; 201 p. 64-73.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Lawson mine, Conisil mine

The Lawson mine included the extremely rich silver-bearing vein referred to as the "Silver Sidewalk", now marked by an opencut on the north side of Brady Lake Road at **km 4.3** (see road log on page 34); it was discovered in 1904 by Murdoch McLeod, part of a prospecting syndicate whose other members were John McLeod, Donald Crawford, and Thomas Crawford. When one of the members sold the claim to H.S. Lawson for $250, court action was instigated to prevent the sale for such a small sum and four years later the property was taken over by LaRose Consolidated Mines Limited. Other rich veins were discovered south of the road, and the mine was known as the Lawson mine. It was worked continuously for silver from 1909 to 1917, and intermittently for silver and cobalt after that. In 1953, Silver-Miller Mines Limited acquired the property and mined it principally for cobalt until 1962. The ore was treated at the company's LaRose mill.

The workings consist of several shafts and opencuts; one shaft was sunk north of the opencut marking the Silver Sidewalk vein, but the more important shafts are south and west of the turn-off (**km 4.1** on Brady Lake Road, see road log on page 34) to the Foster mine. The most recently used shaft (No. 8) is 122 m deep.

The Conisil mine, on the east shore of Giroux Lake and about 450 m south of the Lawson mine, was operated by Silver-Miller Mines Limited from 1959 to 1967; both mines were later leased and worked by Hiho Silver Mines Limited. The underground workings of the Conisil mine extended to those of the Lawson mine. The main shaft, at the lakeshore, is 190 m deep; there are five adits adjacent to it, and one shaft was put down on Island 22 at the northeastern end of Giroux Lake. The deposit was formerly worked by Conisil Mines Limited (1946-1959) and, in the early days, by Giant Silver Nugget Mines Limited. The property is also known as the Nugget claim because numerous silver nuggets were found in the overburden when it was originally prospected; the nuggets consisted of native silver with some metallic and gangue minerals. Production amounted to about 14 416 000 g of silver and some cobalt, copper, and nickel.

A large nugget 165 cm by 74 cm by 46 cm weighing 743 kg was found while the Gem claim to the south was being prospected in 1909. It contained an estimated 302 166 g of native silver occurring as plates forming masses and a filigree network in greywacke. It is believed to have been transported by glaciers from the Kerr Lake veins. The Ontario Department of Lands, Forests, and Mines purchased the specimen for exhibit in the Legislative Building, Toronto.

Base metal mineralization (galena, chalcopyrite, sphalerite, and pyrrhotite) was encountered during mining operations at both mines. Native arsenic has been reported from the Conisil mine, and loellingite from the Lawson mine. See Map 4, No. 12, on page 36.

Refs.: 45 p. 12-13, 37; 57 p. 30-32; 62 p. 21-22; 98 p. 138-140; 103a p. 99-100, 330; 142 p. 164; 146 p. 129; 156 p. 141-142; 160 p. 145; 170 p. 120-121; 201 p. 55-63.

Maps (T): 31 M/5 Cobalt

(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Kerr Lake (Jacobs) mine

This mine one of the great producers of the Cobalt camp, yielded 886 000 000 g of silver and about 294 450 kg of cobalt from 1905 to 1948. The workings are located on both sides of Brady Lake Road, those on the north side being the most extensive and productive. The northern part of the deposit lay beneath Kerr Lake, and the silver-bearing veins extended into the adjoining Crown Reserve property; dewatering of the lake enabled mining of the veins. The orebody contained chalcopyrite, galena, sphalerite, pyrrhotite, and pyrite in addition to silver and cobalt minerals.

The discovery of an argentiferous vein on the shore of Kerr Lake in 1904 by N.C. Wright marked the second such discovery in the Kerr Lake area. The claim was sold to J.A. Jacobs of Montreal for $36 000 a sum recovered with the first carload of ore shipped from the mine. In 1905, Kerr Lake Mining Company Limited acquired the property and mined it until 1928. Reports indicate that for the first fifteen years of operations, mining was phenomenally successful and the mine had the distinction of shipping the highest average grade of ore of any mine then in operation. After 1928, mining was conducted intermittently by a number of companies including Cobalt Consolidated Mining Corporation Limited (1953-1956), which produced nickel, copper, and some gold in addition to silver and cobalt. More recently (1967-1970), Hiho Silver Mines Limited reworked the dumps, shipping the ore to the LaRose mill.

The mine workings consist of a number of shafts, most of them shallow. Shaft No. 13 (43 m deep) is about 122 m south of Brady Lake Road at **km 4.5** (see road log on page 34) and shaft No. 7 is about 55 m north of this point. Most other openings and dumps on the north side of the road have been flooded by the lake. See Map 4, No. 13, on page 36.

Refs.: 45 p. 12, 32; 103a p. 87-92; 201 p. 45-50.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Drummond mine

This deposit was discovered by M.P. Wright a few days before his brother discovered the silver-bearing vein at the Kerr Lake property. It was staked for the poet W.H. Drummond and associates.

The mine was operated by Drummond Mines Limited from 1904 to 1913, by Cobalt Comet Mines Limited from 1913 to 1915, and by Kerr Lake Mines Limited from 1915 to 1917. It produced nearly 124 000 000 g of silver and 113 250 kg of cobalt. During mining operations, sheets of native silver were found in the ore. Chalcopyrite, galena, sphalerite, and pyrite have been reported, along with smaltite and native silver. Specimens of pink calcite with vugs lined with microscopic crystals of quartz and calcite were found in the dumps.

The mine consisted of an open pit, several opencuts, and shafts. The turnoff is at **km 4.8** (see road log on page 34) on Brady Lake Road. See Map 4, No. 14, on page 36.

Refs.: 45 p. 12; 103a p. 158; 170 p. 128-129; 201 p. 27, 30.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Hargrave mine

This mine is one of the smaller producers, having yielded about 15 551 500 g of silver; it is located at **km 5.0** on Brady Lake Road (see road log on page 34).

The mine was operated between 1908 and 1918 by Hargrave Silver Mines Limited, and other companies have been involved in small-scale operations since that time. There are two shafts near the road. See Map 4, No. 15, on page 36.

Ref.: 201 p. 36-39.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Rochester mine

The Rochester Mine was originally worked by Rochester-Cobalt Mines Limited in about 1909, but operations were unprofitable and the work was abandoned. Between 1917 and 1947, small-scale operations were conducted by various individuals. About 466 545 g of silver were produced.

Two shallow shafts, an opencut, and small dumps are located on the west side of Brady Lake Road at **km 6.3** (see road log on page 34). This property and claims to the south were acquired in 1947 by Silver-Miller Mines Limited. See Map 4, No. 16, on page 36.

Refs.: 170 p. 92-93; 202 p. 38, 39, 44, 48, 51.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Beaver mine

The Beaver Mine, originally worked between 1907 and 1924 by Beaver Consolidated Mines Limited, produced (to 1940) about 218 000 000 g of silver, 62 967 kg of cobalt, and some nickel. Its most productive period was prior to 1920.

Underground workings from the main shaft reached a depth of 511 m, the deepest workings in the Cobalt area; a vein at the 488 m level contained native silver (producing 1 250 000 g to 1 500 000 g of silver) and abundant leaf silver in the wall rock. Porphyritic rock containing amphibole phenocrysts was associated with the deposit. Mining was carried out at a reduced scale after 1924. From 1978 to 1988, the mine was operated by Agnico-Eagle Mines Limited.

The road log to the mine is given in the road log to the Timiskaming mine on page 47. See Map 4, No. 19, on page 36.

Refs.: 103a p. 145-152; 202 p. 13-20.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Timiskaming mine

The vein system at this deposit is the same as that at the Beaver mine immediately to the north. Surface showings revealed smaltite and nickeline but little or no silver mineralization; persistent exploration at depth led to the discovery of rich silver-bearing veins. A 22.7 t carload of ore containing 6 307 875 g of silver from the 152 m level was shipped in 1912; this was the richest car lot per tonne shipped from Cobalt to that time. Production began in 1907 and about 373 000 000 g of silver and 90 600 kg of cobalt were obtained to 1963. In 1912, 7265 kg of copper were recovered, the first economic amount of that metal produced in the Cobalt area.

The deposit was discovered in 1906 by a syndicate composed of Charles A. Richardson, R.A. Cartwright, J.L. Wheeler, and B.E. Cartwright. The discovery vein contained smaltite and erythrite but little or no silver. Only when a depth of 24.4 m was reached did the owners strike silver ore, and they "were astonished to find some 15 inches wide of solid metal glistening before them with native silver sticking out all over it." (Ref. 55 p. 136). The following day, May 18, 1907, a large block of this ore was displayed in Cobalt where it caused great excitement "because its discovery under such apparently disadvantageous geological conditions had all along been so little expected". (Ref. 55 p. 136).

The Timiskaming Mining Company Limited, mined the deposit until 1920. A concentrating mill was installed on the site in 1908. The main shaft reached a depth of 488 m and two other shafts were sunk to depths of 12 m and 76 m respectively. Several companies have worked the deposit at various times since 1920. Agnico-Eagle Mines Limited operated the mine from 1978 to 1988. See Map 4, No. 18, on page 36.

Road log to Beaver mine from Brady Lake Road at **km 6.6** (see road log on page 34).

km 0 At junction, turn left (east).

0.5 Junction. Single-lane road on left leads 0.3 km to the *Fisher-Eplett mine*, which was worked for a short time in the early days of the camp. To reach the Beaver and Timiskaming mines, continue straight ahead on main road.

0.6 Turnoff (left) to Beaver mine.

0.7 Timiskaming mine.

Refs.: 45 p. 77; 55 p. 135-138; 103a p. 128-134, 138-140; 153 p. 134-138; 170 p. 210-211; 201 p. 20-23; 202 p. 21-28.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Cochrane mine

The Cochrane mine, which adjoins the Timiskaming mine, has produced a very small amount of silver and cobalt. Most of the production was obtained in 1914 by Cochrane Mines of Cobalt Limited from veins serviced by a shaft located 0.5 km south (by road) of the Timiskaming mine. Since that time, numerous companies have been engaged in exploring and mining the property, but only small shipments of silver and cobalt have been made. See Map 4, No. 20, on page 36.

Ref.: 202 p. 28-31.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Lumsden mine

This mine was a very small producer (about 622 060 g of silver and some cobalt), but exploration from its underground workings from 1947 to 1949 by Silver-Miller Mines Limited led to the discovery of prolific silver-bearing veins beneath Brady Lake; these veins were later mined from a shaft near the south end of the lake on Silver-Miller Mines Limited property.

The Lumsden Mining Company Limited, the original operator, worked the deposit from about 1910 to 1920. The main shaft was sunk to a depth of 122 m.

The mine is on the northeast side of Brady Lake and on the west side of Brady Lake Road at **km 6.7** (see road log on page 34). See Map 4, No. 17, on page 36.

Ref.: 202 p. 38-40, 45.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Silver-Miller (Pan Silver) mine

In 1947, underground exploration from the old Lumsden Mine by Silver-Miller Mines Limited resulted in the discovery of rich silver ore beneath Brady Lake; news of the discovery sparked hopes among miners in the Cobalt area of other discoveries in formerly active mines, and new ore-bearing veins were found when exploration of old deposits was renewed.

The company continued to use the Lumsden shaft until 1949 when it shifted operations to the old Pan Silver shaft (south side of Brady Lake), which it deepened from 61 m to 192 m and renamed Silver-Miller No. 4 shaft. Ore from the newly discovered vein system was exhausted in 1952, and production was obtained from other veins until 1960. Agnico Mines Limited has since used the shaft to work the adjoining Christopher property. Total production from the Brady Lake property from 1947 to 1957 was 229 540 140 g of silver, about 81 540 kg of cobalt, and some nickel and copper. The ore was milled at the company's Brady Lake mill from 1949 to 1957 and subsequently at its LaRose mill.

The original work on the property was performed by Coleman Development Company Limited and Pan Silver Mining Company Limited; Pan Silver put down two shafts before 1909. In the interval to 1947, little work was done on the property.

Gangue minerals are quartz and calcite, and cavities in the gangue are lined with microscopic crystals of quartz. Red feldspar with epidote and small amounts of galena, sphalerite, and chalcopyrite are associated with calcite in the dump of a small shaft at the side of the road leading south from the main shaft; the locality is approximately 105 m from the Silver-Miller mine. See Map 4, No. 21, on page 36.

Road log from **km 7.2** on Brady Lake Road (see road log on page 34):

km	0	Turn right (southwest) at the junction.
	0.1	Silver-Miller shaft No. 4 on right and old Pan Silver shaft on left.
	0.15	Shaft and dump on right. (Epidote-feldspar occurrence).

Refs.: 45 p. 81-82; 202 p. 38-51; 208 p. 31.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Christopher (Columbus) mine

Native silver in leaf and wire forms was found in this deposit at one time. Pyrrhotite, sphalerite, chalcopyrite, pyrite, nickeline, galena, and magnetite occurred with the silver and with cobalt minerals in calcite-quartz gangue. Less common minerals include ruby silver, native bismuth, tetrahedrite, and argentite. The rare minerals xanthoconite and djurleite have been reported. Octahedral crystals of cobaltite about 6 mm in diameter have been found in vugs in quartz-calcite veins; galena, sphalerite, chalcopyrite, pyrite, native bismuth, and cosalite were associated with the crystals. Small yellow apatite crystals up to 3 mm long were also reported from vugs containing cobaltite crystals. Other minerals reported from the deposit are epidote and axinite associated with chalcopyrite in calcite, and a red yttrium silicate that was found as 3 mm fragments in calcite.

The deposit was originally worked in 1905. Columbus Cobalt Silver Company Limited put down the first shaft. Another shaft was sunk in 1915 but no important ore was located. In 1950, Christopher Silver Mines Limited explored the deposit from one of the existing shafts, and Agnico Mines Limited was involved in its exploration and mining from 1954 to 1966. To the end of 1958, the mine produced 46 654 000 g of silver as well as some cobalt, nickel, and copper. Production was obtained from three shafts: Silver-Miller No. 4 shaft, Christopher No. 2 shaft (126.5 m deep), and Cobalt Lode shaft. The underground workings of the Cobalt Lode shaft are connected with those of the Christopher shaft.

Access is via the road leading to the Silver-Miller mine. From shaft No. 4, the road continues from 230 m to a junction; follow the road on the right for about 30 m to the Christopher mine. One of the original Columbus shafts is located 150 m farther west. See Map 4, No. 22, on page 36.

Refs.: 49 p. 221; 118 p. 71, 75-77; 127 p. 28-30; 144 p. 213; 146 p. 132, 133; 159 p. 141; 202 p. 68-79.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Victory mine

Silver-bearing minerals – native silver, argentite, and ruby silver – were found in very small high grade pockets. Leaf silver was also present. Other minerals associated with the deposit included native bismuth, native copper (as films), marcasite, chalcopyrite, siderite, skutterudite, cobaltite, and actinolite.

This mine, also known as the Consolidated Silver Banner mine, was a minor producer of silver and cobalt. Numerous companies were involved in its operation, including Victory Silver Mining Company (1921-1926), Consolidated Silver Banner Mines Limited (1950-1954), Silver Crater Mines Limited (1954-1956), and Amerigo Silver Mines Limited (1963-1965). The shaft is 188 m deep. A small amount of silver was produced in 1964. See Map 4, No. 24, on page 36.

Road log from **km 7.2** on Brady Lake Road (see road log on page 34):

km	0	Junction, turn right (west).
	0.1	Silver-Miller mine.
	0.25	Turnoff (right) to Christopher mine, Columbus mine.
	1.0	Victory mine.

Refs.: 170 p. 122-123; 202 p. 57-68.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Cobalt Lode mine

This deposit became an important producer of silver and cobalt and a minor producer of nickel and copper about forty years after its discovery. Sulphides – pyrite, pyrrhotite, galena, sphalerite, and chalcopyrite – were found along with silver-cobalt-nickel mineralization. Lava rock associated with the deposit contained bands of epidote associated with feldspar.

The deposit was originally worked in 1908 by Pan Silver Mining Company, but only minor production was obtained until 1950 when Cobalt Lake Silver Mines Limited began mining newly discovered high grade silver ore. Production continued until 1957 and totalled nearly 140 000 000 g of silver, 149 490 kg of cobalt, and some nickel and copper. The production shaft is 190 m deep and was used from 1954 to 1966 to mine some of the veins on the Christopher property.

The mine is on the east side of the road leading south from **km 7.2** on Brady Lake Road and 0.3 km south of **km 7.2** (see road log on page 34). See Map 4, No. 23, on page 36.

Refs.: 170 p. 108-109; 202 p. 51-57.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Plate 9

Native silver in wire form, Cobalt Lode mine. National mineral Collection specimen 40582. (GSC 202486J)

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Ophir mine, Mayfair mine

Some veins in these old mines produced only cobalt, others, cobalt and silver; production of both metals was small. Native bismuth has been reported from both mines; native silver was found at the Ophir mine and bog silver at the Mayfair mine. The vein system of the Ophir property extends south into the Mayfair mine; the underground workings of both mines are connected, and the Mayfair shaft was used to mine the Ophir deposit.

Both mines were originally worked in 1910, the Ophir mine by Ophir Cobalt Mines Limited, the Mayfair mine by People's Silver Mines. Several companies were involved in exploration and mining from the early days, but silver and cobalt production was small. The most recent work was done at the Mayfair mine by Mayfair Mines Limited (1945-1946) and Silvermaque Mining Limited (1961-1962), and at the Ophir mine by Silver Crater Mines Limited (1952-1957), the latter using the Mayfair shaft to work the Ophir veins.

The main shafts of the two mines are 125 m apart, the Ophir being north of the Mayfair. Access is by the road leading south from the Victory mine, or by the road leading south from the junction at the south end of Brady Lake. The mines are 0.5 km from the Victory mine and 1.5 km from the junction at **km 7.2** (see road log on page 34) on Brady Lake Road. See Map 4, No. 25 and No. 26, on page 36.

Refs.: 97 p. 128; 98 p. 137-138; 198 p. 27-41.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Mines along Cross Lake Road

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Cross Lake Road:

km	**0**	**Junction Highway 11B and Cross Lake Road (km 8.7) on Highway 11B; proceed onto Cross Lake Road.**
km	**0.15**	**Nipissing mill on right.**
km	**0.3**	**Junction. Mentor mine (page 51) is on left. Road on left leads east to the Nerlip (page 52), Deer Horn (page 52), and Smith Cobalt (page 53) mines. Road log continues straight ahead along Cross Lake Road.**
km	**0.85**	**Junction; road on left leading to the Silver Cliff mine (page 53).**

Mentor mine

A 122 m shaft was sunk on this property by Mentor Exploration and Development Company Limited in 1962. Twenty years earlier, Sycee Cobalt Silver Mines Limited had explored the veins from the adjacent Nipissing 402 shaft.

There was no production from the deposit. The headframe and small dumps are located on the north side of the junction at **km 0.3** on Cross Lake Road. See Map 4, No. 27, on page 36.

Ophir mine, Mayfair mine

Some veins in these old mines produced only cobalt, others, cobalt and silver; production of both metals was small. Native bismuth has been reported from both mines; native silver was found at the Ophir mine and bog silver at the Mayfair mine. The vein system of the Ophir property extends south into the Mayfair mine; the underground workings of both mines are connected, and the Mayfair shaft was used to mine the Ophir deposit.

Both mines were originally worked in 1910, the Ophir mine by Ophir Cobalt Mines Limited, the Mayfair mine by People's Silver Mines. Several companies were involved in exploration and mining from the early days, but silver and cobalt production was small. The most recent work was done at the Mayfair mine by Mayfair Mines Limited (1945-1946) and Silvermaque Mining Limited (1961-1962), and at the Ophir mine by Silver Crater Mines Limited (1952-1957), the latter using the Mayfair shaft to work the Ophir veins.

The main shafts of the two mines are 125 m apart, the Ophir being north of the Mayfair. Access is by the road leading south from the Victory mine, or by the road leading south from the junction at the south end of Brady Lake. The mines are 0.5 km from the Victory mine and 1.5 km from the junction at **km 7.2** (see road log on page 34) on Brady Lake Road. See Map 4, No. 25 and No. 26, on page 36.

Refs.: 97 p. 128; 98 p. 137-138; 198 p. 27-41.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Mines along Cross Lake Road

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Cross Lake Road:

km	**0**	**Junction Highway 11B and Cross Lake Road (km 8.7) on Highway 11B; proceed onto Cross Lake Road.**
km	**0.15**	**Nipissing mill on right.**
km	**0.3**	**Junction. Mentor mine (page 51) is on left. Road on left leads east to the Nerlip (page 52), Deer Horn (page 52), and Smith Cobalt (page 53) mines. Road log continues straight ahead along Cross Lake Road.**
km	**0.85**	**Junction; road on left leading to the Silver Cliff mine (page 53).**

Mentor mine

A 122 m shaft was sunk on this property by Mentor Exploration and Development Company Limited in 1962. Twenty years earlier, Sycee Cobalt Silver Mines Limited had explored the veins from the adjacent Nipissing 402 shaft.

There was no production from the deposit. The headframe and small dumps are located on the north side of the junction at **km 0.3** on Cross Lake Road. See Map 4, No. 27, on page 36.

Refs.: 170 p. 260; 204 p. 198.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Nerlip mine

The Nerlip mine produced a small amount of cobalt and nickel and some silver in the early 1940s. The property was prospected in the 1930s when the rich deposit at the adjoining Deer Horn (Cross Lake O'Brien) property was found. In 1931, a shaft was sunk to 27 m by J.C. O'Donald and A.B. Pilliner. Most of the work, however, including deepening the shaft to 232 m, was done by Nerlip Mines Limited between 1936 and 1943. The mine was leased and worked by Augener Mines Limited in 1944-1945.

The mine is located on a ridge overlooking Cross (Crosswise) Lake. The headframe, some buildings and rock dumps remain on the site. The turnoff to the mine is 1 km from the junction at **km 0.3** on Cross Lake Road (see road log on page 51). See Map 4, No. 28, on page 36.

Ref.: 199 p. 11-17.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Deer Horn (Cross Lake O'Brien) mine

The Deer Horn mine ranks among the great producers of the Cobalt camp; prior to 1951, its yield was 590 957 000 g of silver, and between 1960 and 1969 another 93 309 000 g was won. The mine also produced about 317 100 kg of cobalt and some nickel and copper.

The property was originally staked in 1907, but the rich silver-bearing veins were discovered later (in 1923) by M.J. O'Brien Limited, which mined the deposit until 1940. Subsequently, the mine was operated by Cross Lake Lease (1940-1942), Shag Silver Mines Limited (1949-1953), and finally Deer Horn Mines Limited (1959-1969). The underground workings extend to a depth of 311 m. The mine is located on a steep ridge overlooking Cross Lake, which occupies a northwest-trending fault several kilometres long.

Minerals common to the Cobalt deposits have been reported from this mine, including loellingite, skutterudite, cobaltite, rammelsbergite, native silver, chalcopyrite, safflorite, tetrahedrite, arsenopyrite, chloanthite, nickeline, smaltite, breithauptite, gersdorffite, argentite, pyrite, pyrargyrite, galena, sphalerite (dark brown), pyrrhotite, and marcasite. Ullmannite, allargentum, and dyscrasite have also been identified. Nodules of pyrite 2 cm in diameter and coated with gypsum and goethite were found in the dumps. Colourless to white calcite, also found in the dumps, fluoresces bright pink when exposed to short ultraviolet rays.

The turnoff to the mine is 1.8 km from the junction at **km 0.3** on Cross Lake Road (see road log on page 51). The headframe and mine buildings remain at the site. See Map 4, No. 30, on page 36.

Refs.: 141 p. 193-194; 142 p. 185; 160 p. 107-108; 170 p. 124-125; 200 p. 15-22; 251 p. 106; 255 p. 111.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Smith Cobalt mine

This mine has produced a very small amount of cobalt. It was operated in 1934-1935 and in 1940 by Smith Cobalt Mines Limited; a shaft, from which underground workings extended to a depth of 152 m, was used. Cobalt, silver, nickel, and copper mineralization was present. See Map 4, No. 31, on page 36.

Road log from the junction at **km 0.3** on Cross Lake Road (see road log on page 51):

km	0	From junction at Mentor mine, proceed along road on left.
	1.0	Turnoff (left) to Nerlip mine.
	1.8	Turnoff (right) to Deer Horn mine. The road narrows at this point.
	2.1	Junction, turn left (right fork leads to an old shaft on the Deer Horn property).
	2.3	Smith Cobalt mine.

Refs.: 170 p. 208-209; 200 p. 6-11.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Silver Cliff mine

Heavy leaf silver was found in wall rock when this property was originally explored. Between 1908 and 1954, the mine produced about 15 551 500 g of silver and approximately 6800 kg of nickel, 4080 kg of cobalt, and 2720 kg of copper. Production came from adit no. 2 on the south side of the mill. Other workings include a 49 m shaft (opposite the mill) and two adits. Underground workings of the Colonial mine to the west and of the King Edward mine to the south were used to explore the Silver Cliff property.

Silver Cliff Mining Company Limited began underground development of the property in about 1907. By 1911, two adits had been driven, the shaft put down, and a mill installed. Various companies conducted operations at intervals after that date. The mill was reconditioned in the 1940s by A.B. Pilliner and Associates, and has since been used to treat ore from the Silver Cliff and from other properties.

The mine and mill are located at the northwestern end of Cross Lake and 0.5 km from **km 0.85** on Cross Lake Road (see road log on page 51). See Map 4, No. 29, on page 36.

Refs.: 45 p. 93; 170 p. 202-204; 199 p. 44-52.

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

M121

IMPORTANT NOTE CONCERNING THE FOLLOWING PAGES

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Mines along Highway 567, south of Cobalt

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Highway 567, south of Cobalt:

km	0	Junction, highways 11B and 567 in North Cobalt; proceed onto Highway 567.
km	2.2	Junction, road on right leads south to Harrison-Hibbert mine and Ruby mine (page 56). The Hunter Cobalt mine (page 54) is opposite the junction.
km	2.4	Turnoff (right) to Green-Meehan mine and Red Rock mine (page 58).
km	2.6	Turnoff (left) to Cobalt Contact mine (page 58).
km	3.1	Turnoff (left) to Agaunico mine (page 59) and to Bucke Township Park.
km	8.0	Martineau Bay, Lake Timiskaming on left.
km	20.9	Turnoff (left) to Timiskaming Mission Historic Site. A plaque marks the site on the shore of Lake Timiskaming where a mission was established in 1863. The site is 3.5 km from Highway 567.
km	26.7	Junction, road on left leads east to Maidens Bay and to the Canadian Lorrain mine (page 59) and the Nipissing Lorrain mine (page 61).
km	28.1	Junction. Highway 567 continues to the Montreal River power dam. Proceed south along the road on right to Silver Centre and Trout Lake.
km	29.5	Single-lane road on left leading east to Bellellen mine (page 61).
km	30.2	Junction at Frontier mine (page 62). The former settlement of Silver Centre was located here. Proceed south.
km	30.5	Junction. The road on left leads east the Keeley mine (page 62) and to the Wettlaufer and Curry mines (page 64). The road log continues south.
km	31.0	Lorrain Trout Lake mine old shaft on west side of road.
km	31.5	Lorrain Trout Lake mine No. 2 shaft (page 64).

Hunter Cobalt mine

Three shafts and some pits and small dumps of the Hunter Cobalt mine are located on the north side of Highway 567 about 100 m north of the turnoff to the Harrison-Hibbert mine at **km 2.2**. See Map 5, No. 1, on page 55, and road log on page 54. The deepest shaft is about 30 m deep. The property was originally worked in about 1908 by Hunter Cobalt Silver Mining Company Limited; further exploratory work was performed in 1925-1926 by Cobalt Contact Mines Limited. There is no record of production from the mine.

Cobaltite, chalcopyrite, pyrite, and sphalerite occur in pink dolomite in the dumps.

Refs.: <u>46</u> p. 60; <u>196</u> p. 125-127.

Mines along Highway 567, south of Cobalt

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along Highway 567, south of Cobalt:

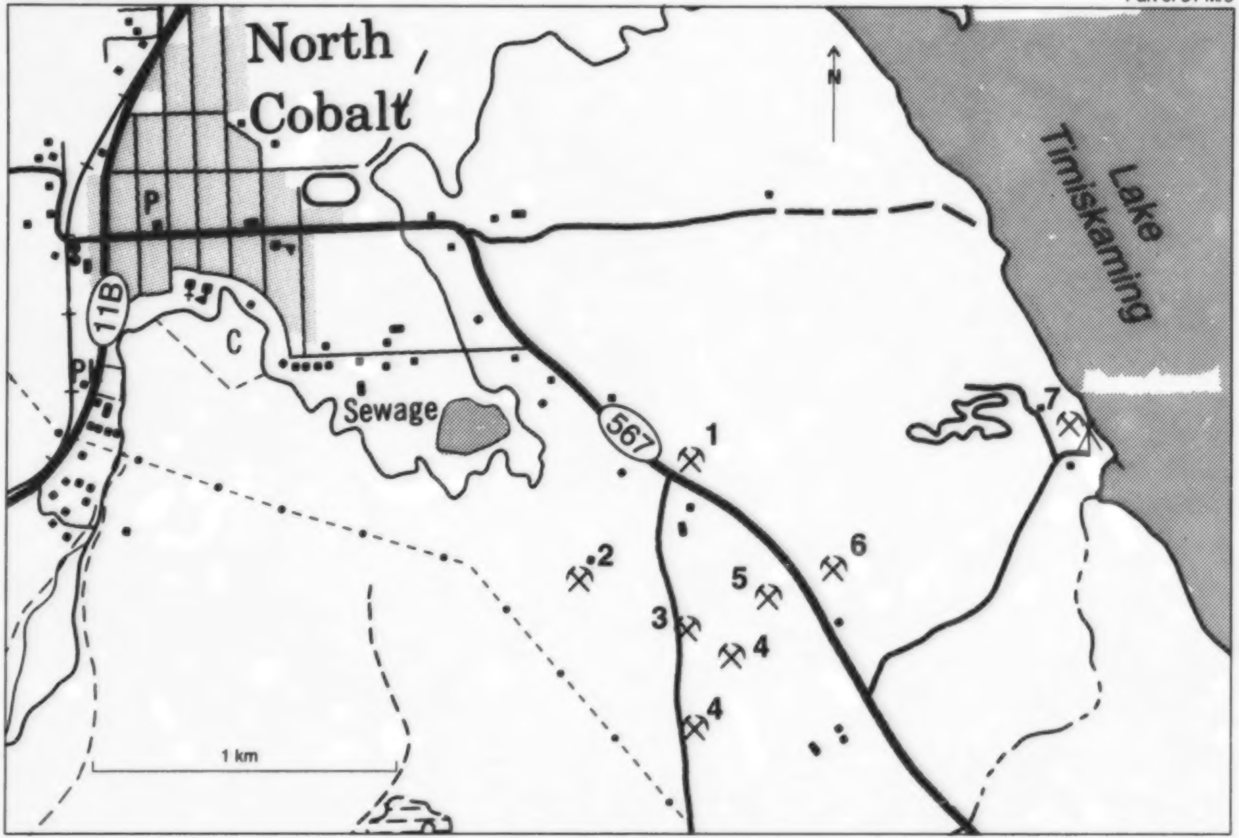
km	**0**	Junction, highways 11B and 567 in North Cobalt; proceed onto Highway 567.
km	**2.2**	Junction, road on right leads south to Harrison-Hibbert mine and Ruby mine (page 56). The Hunter Cobalt mine (page 54) is opposite the junction.
km	**2.4**	Turnoff (right) to Green-Meehan mine and Red Rock mine (page 58).
km	**2.6**	Turnoff (left) to Cobalt Contact mine (page 58).
km	**3.1**	Turnoff (left) to Agaunico mine (page 59) and to Bucke Township Park.
km	**8.0**	Martineau Bay, Lake Timiskaming on left.
km	**20.9**	Turnoff (left) to Timiskaming Mission Historic Site. A plaque marks the site on the shore of Lake Timiskaming where a mission was established in 1863. The site is 3.5 km from Highway 567.
km	**26.7**	Junction, road on left leads east to Maidens Bay and to the Canadian Lorrain mine (page 59) and the Nipissing Lorrain mine (page 61).
km	**28.1**	Junction. Highway 567 continues to the Montreal River power dam. Proceed south along the road on right to Silver Centre and Trout Lake.
km	**29.5**	Single-lane road on left leading east to Bellellen mine (page 61).
km	**30.2**	Junction at Frontier mine (page 62). The former settlement of Silver Centre was located here. Proceed south.
km	**30.5**	Junction. The road on left leads east the Keeley mine (page 62) and to the Wettlaufer and Curry mines (page 64). The road log continues south.
km	**31.0**	Lorrain Trout Lake mine old shaft on west side of road.
km	**31.5**	Lorrain Trout Lake mine No. 2 shaft (page 64).

Hunter Cobalt mine

Three shafts and some pits and small dumps of the Hunter Cobalt mine are located on the north side of Highway 567 about 100 m north of the turnoff to the Harrison-Hibbert mine at **km 2.2**. See Map 5, No. 1, on page 55, and road log on page 54. The deepest shaft is about 30 m deep. The property was originally worked in about 1908 by Hunter Cobalt Silver Mining Company Limited; further exploratory work was performed in 1925-1926 by Cobalt Contact Mines Limited. There is no record of production from the mine.

Cobaltite, chalcopyrite, pyrite, and sphalerite occur in pink dolomite in the dumps.

Refs.: 46 p. 60; 196 p. 125-127.



Map 5. North Cobalt area

1. Hunter Cobalt mine 2. Harrison-Hibbert mine 3. Ruby mine 4. Red Rock mine
5. Green-Meehan mine 6. Cobalt Contact mine 7. Aguanico mine

Maps (T): 31 M/5 Cobalt
(G): 2050 Cobalt silver area, northern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Harrison-Hibbert mine, Ruby mine

About 15 551 500 g of silver were produced from each of these mines, along with cobalt and some copper. Minerals in the deposit included native silver, ruby silver, smaltite, chalcopyrite, pyrite, sphalerite, galena, specular hematite, chlorite, calcite (white), and dolomite (pink); small amount of bornite and chalcocite have been reported. Calcite specimens obtained from the dumps fluoresce bright pink when exposed to short ultraviolet rays. Encrustations of erythrite and of colourless to white gypsum were observed on specimens in the dumps.

The Ruby mine was the first to be worked. The shaft was put down to 17 m in 1907 by Ruby Silver Mining and Development Company, Limited. Silver was first obtained in 1920 by Ruby Operative Cobalt Mines Limited, and some silver and cobalt were produced between 1922 and 1924 by Coniagas Mines Limited; most of the production, however was obtained by Cobalt Contact Mines from 1927 to 1930. The deposit was worked by Harrison-Hibbert Mines Limited between 1951 and 1954. The shaft is 49 m deep.

The silver-cobalt-bearing veins on the Harrison-Hibbert property were discovered by R.C. Harrison in 1947. The Discovery vein assayed 171 400 to 342 800 g/t of silver and was encountered 44.5 m from the surface, the first 9 m being overburden. The deposit was worked from a 79 m shaft until 1954 by Harrison-Hibbert Mines Limited, in 1963 by Silvermaque Mining Limited, and over the next two years by Pittsonto Mining Company Limited.

The mines are located in Ruby Valley, about 2.5 km from North Cobalt. See Map 5, No. 2 and No. 3, on page 55.

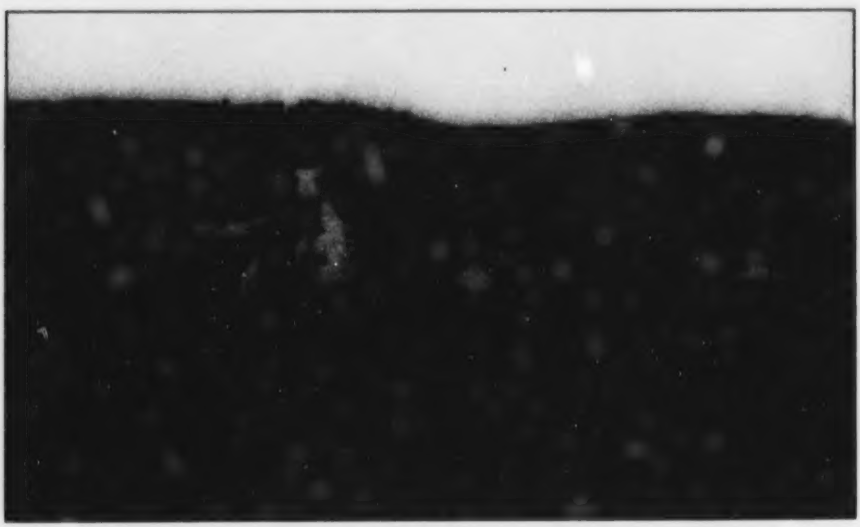


Plate 10

Harrison-Hibbert mine, 1972. (GSC 161459)

Road log from **km 2.2** on Highway 567 (see road log on page 54):

km 0 Turn right (south).

0.4 Junction. Road on right leads 0.25 km to the Harrison-Hibbert mine. Continue straight ahead to reach the Ruby mine.

0.5 Ruby mine on left.

Refs.: 46 p. 90; 103a p. 179-180; 156 p. 140-141; 157 p. 132; 158 p. 133-134; 196 p. 95-115.

Plate 11

The leaning headframe of the Ruby mine, 1972. (GSC 161458)

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Green-Meehan mine, Red Rock mine

Some very rich oreshoots were encountered at the time of the discovery of silver-bearing veins on the Green-Meehan and Red Rock properties, but neither mine became a great producer. In 1905, rich silver ore was found by Philip Green on the Green-Meehan property; the following year, Green-Meehan Mining Company Limited undertook development of the property and sank a 61 m shaft, but results at depth were disappointing. Between 1905 and 1907, Red Rock Silver Mining Company Limited put down a shaft to a depth of 33.5 m (on the Red Rock property) where a rich oreshoot 4.9 m long produced $20 000 worth of silver ore. Both mines were acquired by Consolidated Silver Cobalt Mines Limited in 1909 and worked jointly until 1912. Other operators of the two mines included Edwards and Wright Limited (1917-1922) and Cobalt Contact Mines Limited (1925-1928); the latter company erected a mill at the Green-Meehan mine and treated ore from the two mines and from other mines in the area. The Green-Meehan mine consists of two shafts of 61 m and 26 m deep respectively. There are three shafts on the Red Rock property, the deepest being 33.5 m deep.

Pyrite, chalcopyrite, and chlorite occur in white calcite specimens in the dumps; the calcite fluoresces deep pink under long ultraviolet rays. Stromeyerite and posnjakite (greenish-blue scaly coatings on specimens) were also found.

The Green-Meehan mine and the mill's foundation are on the south side of Highway 567 at **km 2.5** (see road log on page 54). One shaft of the Red Rock mine is immediately south of the Green-Meehan main shaft, another (the main shaft) is about 100 m east of the Ruby mine, and the third is on the east side of the road leading south from the Ruby mine at a point 275 m from it. See Map 5, No. 4 and No. 5, on page 55.

Refs.: 46 p. 42-43, 57-58, 87; 103a p. 174-177; 170 p. 312-313; 196 p. 127-131.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Cobalt Contact mine

Specimens of colourless to white calcite rhombohedra studded with tiny pyrite cubes were found in the dumps of this former cobalt-silver producer. Calcite crystals and massive white calcite associated with them fluoresce bright pink when exposed to ultraviolet rays. Chalcopyrite, pyrite, cobaltite, chlorite, erythrite, and dolomite were also found in the dumps.

The mine produced cobalt and a minor amount of silver. The silver-bearing vein discovered on this claim in 1905 was the first silver discovery northwest of Cobalt. By 1909, Cobalt Contact Mining Company had located and explored all the important veins now known and had put down a shaft to 40 m. Additional work was done by Cobalt Contact Mines Limited (1924-1926), and by various individuals and companies between 1930 and 1952. The workings include three shafts, the deepest being 70 m.

The mine is located 0.2 km east of **km 2.6** on Highway 567 (see road log on page 54). A small building and some dumps remain on the site. See Map 5, No. 6, on page 55.

Refs.: 46 p. 25; 170 p. 306-307; 196 p. 117-123.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Agaunico mine

Cobaltite was the most common mineral at this deposit. Nickeline, chalcopyrite, pyrite, galena, and sphalerite were also present, and specimens of bluish-white quartz containing native gold were at one time found in the mine dumps. Colourless to white 'dogtooth' crystals of calcite and massive white calcite from the dumps fluoresce bright pink under 'short' ultraviolet rays, and reddish pink under 'long' ultraviolet rays. Specimens of grey and white varved clay coated with erythrite are common in the dumps; the clay is postglacial and occurs on the surface of the property.

Cobaltite was discovered near the existing shaft in 1904 by Ira Benn. Until the 1930s, the deposit was worked intermittently by several companies with little success. The deposit contained silver but not in economic quantity; it was worked successfully for cobalt from about 1930 to 1957. In 1952, economic silver-bearing veins were discovered and mining for silver was conducted until the mine was closed in 1961.

The mine produced about 2 000 000 kg of cobalt, 31 103 000 g of silver, 226 500 kg of nickel, and nearly 90 600 kg of copper. It was the largest cobalt producer in the Cobalt camp. The most recent operators were Silanco Mining and Smelting Corporation (1944-1953), Cobalt Consolidated Mining Corporation Limited (1953-1957), and Agnico Mines Limited (1957-1961).

The mine is located on the steep western shore of Lake Timiskaming. See Map 5, No. 7, on page 55. Access is by a 1.3 km road leading northeast from **km 3.1** on Highway 567 (see road log on page 54). The Bucke Township Park is located near the mine.

Refs.: 97 p. 117; 170 p. 304-305; 196 p. 137-154.

Maps (T): 31 M/5 Cobalt
(G): 2052 Cobalt silver area, southeastern sheet, Timiskaming district (Ontario Geological Survey, 1:12 000)

Canadian Lorrain (Maidens) mine

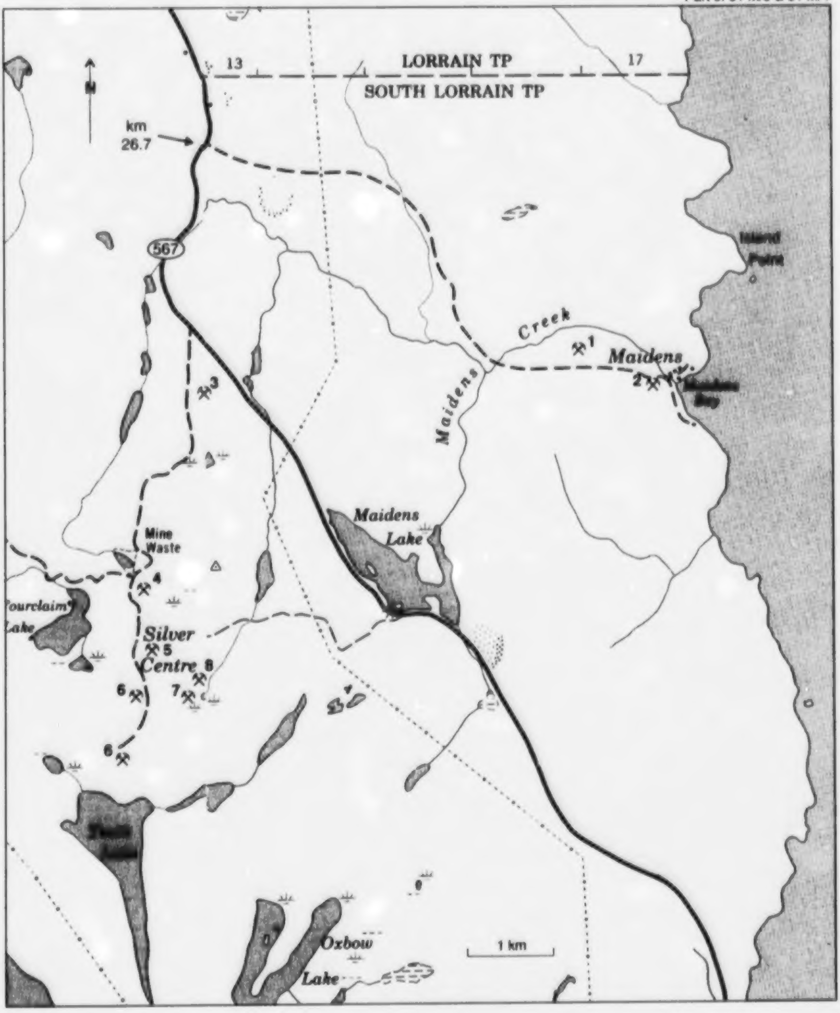
During mining operations, native silver in leaf and wire forms was found at this property. Smaltite, nickeline, and pyrite were also present in calcite veins. Between 1926 and 1943, the mine produced about 8 615 531 g of silver, 7700 kg of cobalt, and some nickel.

Maidens Silver Mining Company Limited began developing the deposit in about 1909; two adits (each about 49 m long) were driven south into a hill and two shafts were put down about 275 m west of the adits. Canadian Lorrain Silver Mines Limited acquired the property in 1922 and continued work on it until 1927, the most productive year in the history of the mine; one of the shafts was deepened to 76 m during this period. Minor production was obtained by Millwights Mines Limited between 1938 and 1940. Since then, various companies have carried out exploration work.

The mine is located on the north side of the road to Maidens Bay at a point 3.7 km east of its junction with Highway 567 at **km 26.7** of the road log on page 54. See Map 6, No. 1, on page 55.

Refs.: 103a p. 230-233; 121 p. 34-36.

Part of 31 M/3 & 31 M/4



Map 6. South Lorrain area

1. Canadian Lorrain mine
2. Nipissing Lorrain mine
3. Bellellen mine
4. Frontier mine
5. Keeley mine
6. Lorrain Trout Lake mine
7. Curry mine
8. Wettlaufer mine

Maps (T): 31 M/3 Fabre
(G): 2194 South Lorrain Township, Timiskaming district (Ontario Geological Survey, 1:31 680)

Nipissing Lorrain mine

This mine produced about 10 886 050 g of silver and small amounts of cobalt and nickel; most production was obtained by Nipissing Mining Company Limited between 1925 and 1929. Minor work was done by other companies including the most recent (1966) operator, Millerfields Silver Corporation Limited. The workings extend to a depth of 168 m.

The mine is located on the steep shore of Maidens Bay, 4.3 km from the junction of Highway 567 and the road to Maidens Bay (see road log on page 54). See Map 6, No. 2, on page 60.

Ref.: 121 p. 60-62.

Maps (T): 31 M/3 Fabre
(G): 2194 South Lorrain Township, Timiskaming district (Ontario Geological Survey, 1:31 680)

Bellellen mine

Several individuals and companies mined small amounts of silver, cobalt, and nickel from this deposit at various times between 1910 and 1943. Bellellen Silver Mines Limited operated the mine from 1909 to 1926, and most of the silver produced from the deposit was obtained in 1910 and 1911. Two shafts were used, one 24.4 m deep and the other, 104 m. The property belongs to J.H. Price of Cobalt.

Plate 12

Bellellen mine, 1911. (Courtesy of Ontario Archives Acc.16959-133)

The mine is located about 275 m east of the road to Silver Centre at **km 29.5** (see road log on page 54). See Map 6, No. 3, on page 60.

Refs.: 103a p. 229-230; 121 p. 71-72, 73.

Maps (T): 31 M/4 Temagami
(G): 2194 South Lorrain Township, Timiskaming district (Ontario Geological Survey, 1:31 680)

Frontier mine, Keeley mine

The Frontier mine and the Keeley mine were the largest producers of the South Lorrain silver camp, accounting for over 80 per cent of the silver output. The Keeley mine accounted for over half the silver produced from South Lorrain. From 1908 to 1942, the Keeley mine produced 378 036 841 g of silver, 732 856 kg of cobalt, and 333.4 kg of nickel. From 1921 to 1965, the Frontier mine produced 219 060 295 g of silver, 766 826 kg of cobalt, 12 012 kg of nickel, and 4662 kg of copper. Originally, the mines were operated by separate companies, but in the last operating period from 1961 to 1966, they were worked jointly by Canadian Keeley Mines Limited (renamed Keeley Frontier Mines Limited in 1964).

Plate 13

Frontier mine, 1972. (GSC 161461)

Minerals found in the orebody included smaltite, cobaltite, chloanthite, nickeline, native silver, argentite, ruby silver, pyrite, arsenopyrite, marcasite, breithauptite, chalcopyrite, native bismuth, magnetite, stromeyerite, and less commonly, galena, sphalerite, covellite, and dyscrasite. The rare minerals matildite and pavonite have been reported to occur with galena, chalcopyrite, bismuthinite, native bismuth, sphalerite, and pyrite. Xanthoconite has been found as hemispherical radiating aggregates of tiny crystals associated with proustite at the Keeley mine.

Gangue minerals were pink and white calcite, pink and white dolomite, quartz, chlorite, and small amounts of apatite, tremolite, and biotite. White calcite specimens from the dumps fluoresce bright pink under short ultraviolet rays and a reddish pink under long rays. Massive white quartz contains vugs lined with colourless microscopic crystals of quartz. A dense, hard, silicified carbonate in variegated tones of white, grey, pink, and salmon pink has been reported from the deposit.

A block of silver ore weighing 1.995 t from the fabulously rich Wood's vein, Keeley mine, is displayed in a 1.5 m high glass case in the West Wing of the Ontario Legislative Assembly building at Queen's Park, Toronto; the silver content is estimated to be 821 000 g (L.M. Cummings, pers. comm., 1993). Native silver occurred as slabs weighing up to 4.5 kg, as moss silver, and in leaf, wire, flaky, and matted forms; the wire and leaf forms were found in vugs in massive smaltite. Specimens of botryoidal smaltite coated with leaf silver were also encountered during early mining operations. Some of the silver mineralization occurred in a limonite clay produced by weathering (oxidation) of part of a vein that contained metallic minerals and of adjacent wall

Plate 14

Keeley mine, 1910. (Courtesy of Ontario Archives Acc.16959-137)

rock. The vein in which this was found was known as Wood's vein and was the most important on the property. The oxidation extended to a depth of 171 m; weathering at depth was not encountered at any other mine in the Cobalt area. The clay was greyish, yellowish, reddish, greenish, or bluish and consisted of limonite and clay minerals, some carbonate, native silver, argentite, ruby silver, wad, hematite, goethite, chlorite, and traces of malachite, azurite, erythrite, annabergite, scorodite, and chapmanite. The bluish clay was rich in wire, scaly, platy, and stalactitic silver. Leaf silver and spongy silver were associated with massive and botryoidal smaltite. Specimens of smaltite, nickeline, erythrite, annabergite, epidote, and carbonates are common in the dumps.

Silver-cobalt mineralization was discovered first at the Keeley property in 1907 by J.M. Wood and R.J. Jowsey who, with Charles Keeley, were responsible for the first shipment of ore from an open pit in 1908. Smaltite and wire silver in calcite were found in the discovery vein. The property was sold to Keeley Mine Limited, which worked it until 1913. There was little activity until 1921 when Dr. J. Mackintosh Bell discovered rich oreshoots, a discovery that revived prospecting interest in the South Lorrain area. Keeley Silver Mines Limited operated the mine and mill continuously from 1921 to 1931; the mine was reopened in 1961 by Keeley Frontier Mines Limited.

High grade ore was discovered at the Frontier mine in 1921 by Horace F. Strong. The Mining Corporation of Canada Limited mined the deposit from 1921 to 1931, after which the mine was operated sporadically under lease. In 1961, Keeley Frontier Mines Limited reopened the mine and brought it into production. In 1971-1972, Agnico Mines Limited undertook a program of exploration of the deposit.

Each mine consists of numerous shafts. The main working shaft of the Keeley mine is 174 m deep, that of the Frontier, 195.5 m deep. The deepest workings – at 444 m and 415 m – are on the Frontier property. The underground workings of the two mines were connected in 1962.

The Frontier mine is on the east side of the Silver Centre road at **km 30.2**; the Keeley mine is 200 m east of **km 30.5** on this road (see road log on page 54). See Map 6, No. 4 and No. 5, on page 60.

Refs.: 8 p. 9-11; 9 p. 688-692; 13 p. 368-371; 90 p. 249; 97 p. 122; 104 p. 190-228; 121 p. 25, 37-45; 144 p. 216, 217; 146 p. 132, 133-134; 159 p. 144-145; 164 p. 8; 253 p. 50.

Maps (T): 31 M/4 Temagami
(G): 2194 South Lorrain Township, Timiskaming district (Ontario Geological Survey, 1:31 680)

Wettlaufer mine, Curry mine, Lorrain Trout Lake mine

Agnico Mines Limited began exploration of these former producers in 1968. The mines are located south and southeast of the Keeley mine. Most of the work has been done on the Lorrain Trout Lake property.

The Wettlaufer mine was the most successful of the early silver producers in South Lorrain; it yielded about 77 757 500 g of silver, nearly all of it before 1913. Native silver is believed to have first been observed on this property in 1874 by Pat Manion, a lumberman who noticed a fragment of a gleaming silver metal exposed by an uprooted tree. The deposit was staked some 30 years later. Production began in 1909 and was obtained from one vein in diabase. Wettlaufer Silver Mines Limited operated the mine until 1913; there was limited production from subsequent operations by other companies. In 1957, the mine was acquired by Agnico Mines Limited along with the adjoining (to the southwest) Curry mine. The shaft is 76 m deep.

The Curry mine produced almost 1 555 150 g of silver between 1916 and 1938. The original work (1912-1918) was done by Pittsburgh Lorrain Syndicate and most of the mine's production was obtained by that company. Two shafts were used, one 122 m deep and the other, 33.5 m.

The Lorrain Trout Lake mine is also referred to as the Trout Lake mine. Early work, including the sinking of two shafts, was performed by Lorrain Trout Lake Mines Limited from 1923 to 1931, and nearly all of the mine's silver (just over 31 103 000 g) and cobalt production was obtained during this period. Minor amounts of silver, cobalt, and a little nickel were produced from subsequent operations. In 1954, Ramardo Mines Limited explored the deposit and leased it in 1968 to Agnico Mines Limited, which then commenced exploration of No. 2 shaft and installed buildings and equipment. The company deepened the production shaft to 335.5 m. Ore was treated at the Penn mill. Operations ended in 1975.

The Wettlaufer mine is 500 m southeast of the Keeley mine and the Curry mine is immediately southwest of the Wettlaufer. Follow the road leading east from the Keeley mine for 500 m to a trail leading south. Proceed 350 m along this trail to the Wettlaufer mine. Access to the Curry mine is by a 170 m trail leading southwest from the Wettlaufer mine. The Lorrain Trout Lake mine shafts are at **km 31.0** and **km 31.5** on the road log on page 54. See Map 6, No. 6, No. 7, and No. 8, on page 60.

Refs.: 103a p. 224-229; 121 p. 25, 27, 28-33, 74-79; 161 p. 105; 162 p. 104; 206 p. 47; 253 p. 50.

Maps (T): 31 M/4 Temagami
(G): 2194 South Lorrain Township, Timiskaming district (Ontario Geological Survey, 1:31 680)

ELK LAKE – GOWGANDA – SHINING TREE AREA

Following the discoveries of rich silver ore in the vicinity of Cobalt, prospectors shifted their attention westward and northwestward. They were searching for diabase – the rock favourable to the occurrence of the Cobalt silver ores. In August 1906, the White brothers found native silver at Anvil Lake (north of Lady Evelyn Lake), and that autumn Thomas Saville discovered silver-cobalt mineralization at a locality 3 km east of Elk Lake village (lot 1, concession V, James Township). As a result of these discoveries, prospectors invaded the Elk Lake area in 1907, numerous claims were staked, and the stampede pushed onward to the Gowganda Lake area where silver ore was discovered in 1908 near the shore of Leroy Lake. The spectacular ore specimens from these newly found localities were displayed at the Mining Recorder's office at Elk Lake and generated a surge of frenzied claim staking by snow shoe clad prospectors in the snow-covered area around Gowganda Lake in the winter of 1908-1909. In the summer (1909), prospecting spread toward Shining Tree with less encouraging results. During the 'rush', 7000 claims were staked in Gowganda and 2000 in the surrounding area. The villages of Elk Lake (formerly Elk City) and Gowganda (an Indian word meaning porcupine's home) sprang into existence as a result of the prospecting rush.

Development of the deposits rapidly followed their discoveries. Mining equipment was brought into the areas in the winter of 1909 by horse-drawn vehicles from the nearest railway centres at Sellwood and Charlton. Underground exploration began in the spring. Since transportation posed an economic burden on mining, only high grade ore was shipped in the early days.

Production began in 1909 with the shipment of 1.8 t of ore from the Bartlett mine on the west side of Gowganda Lake. Most of the mining activity in the Elk Lake area took place between 1907 and 1913; there were no large producers and most of the old mines are now difficult to locate. The easily accessible ones are described beginning on page 69. Mines in the Gowganda area began producing silver and cobalt in 1909, most of the production coming from the Miller Lake mines at O'Brien; operations at O'Brien ceased in 1972. Production from the Gowganda mines to the end of 1966 amounted to 1 820 556 626 g of silver, ranking the camp second to Cobalt. Production in the area ended in 1988.

The silver-cobalt deposits in the Elk Lake and Gowganda areas are mineralogically similar to those at Cobalt and at South Lorrain. Native silver, the chief economic mineral, is associated with the same suite of metallic minerals as are listed on page 17. There are, however, some differences. In the Elk Lake and Gowganda deposits, the gangue is calcite and quartz with some barite and little (at Elk Lake) or no (at Gowganda) dolomite, and the rock containing the veins is predominantly diabase. Ore-bearing veins at Elk Lake are associated with aplite dykes cutting the diabase; they contain large amounts of chalcopyrite and bornite. Loellingite is common in the Elk Lake-Gowganda district and rare at Cobalt. Bismuthinite, hematite, epidote, and purple axinite occur in some veins in the Gowganda deposits.

Refs.: 12 p. 169-170; 16 p. 1-2; 25 p. 3; 33 p. 5-8; 34 p. 259; 60 p. 8; 117 p. 1; 142 p. 164; 145 p. 101-103; 170 p. 3; 254 p. 344.

Maps (T): 41P Gogama

(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury and Timiskaming districts (Ontario Geological Survey, 1:253 440)
GDIF 498 Mickle Township (Ontario Geological Survey, 1:31 680)
GDIF 504 Nicol Township (Ontario Geological Survey, 1:31 680)
GDIF 506 Leith Township (Ontario Geological Survey, 1:31 680)
GDIF 508 Tyrrell Township (Ontario Geological Survey, 1:31 680)
GDIF 516 Corkill Township (Ontario Geological Survey, 1:31 680)
GDIF 518 Macmurchy Township (Ontario Geological Survey, 1:31 680)

Mines along highways 65 and 560

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log for mines along highways 65 and 560:

km	0	Junction, Highway 65 (west) and Highway 11, west of New [illegible]; proceed west along Highway 65.
km	27.2	Junction, Highway [illegible].
km	[illegible]	Granitic rocks are exposed on both sides of Highway 65.
km	[illegible]	Elk Lake village, at junction of Highway 560 on the east side of Elk Lake, a broadening of the Montreal River. This is the turnoff to Moose Horn (page 67), Ethel Copper (page 69) and Jackpot (page 71) mines. The road log continues over the bridge.
km	[illegible]	Junction, highways 560 and 65; road log continues along Highway 560. Highway 65 leads to Mother-Lode (page 71) and Hubert Lake mines (page 72).

Production began in 1909 with the shipment of 1.8 t of ore from the Bartlett mine on the west side of Gowganda Lake. Most of the mining activity in the Elk Lake area took place between 1907 and 1913; there were no large producers and most of the old mines are now difficult to locate. The easily accessible ones are described beginning on page 69. Mines in the Gowganda area began producing silver and cobalt in 1909, most of the production coming from the Miller Lake mines at O'Brien; operations at O'Brien ceased in 1972. Production from the Gowganda mines to the end of 1966 amounted to 1 820 556 626 g of silver, ranking the camp second to Cobalt. Production in the area ended in 1988.

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Refs.: 12 p. 169-170; 16 p. 1-2; 25 p. 3; 33 p. 5-8; 34 p. 259; 60 p. 8; 117 p. 1; 142 p. 164; 145 p. 101-103; 170 p. 3; 254 p. 344.

Maps (T): 41P Gogama
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury and Timiskaming districts (Ontario Geological Survey, 1:253 440)
GDIF 498 Mickle Township (Ontario Geological Survey, 1:31 680)
GDIF 504 Nicol Township (Ontario Geological Survey, 1:31 680)
GDIF 506 Leith Township (Ontario Geological Survey, 1:31 680)
GDIF 508 Tyrrell Township (Ontario Geological Survey, 1:31 680)
GDIF 516 Corkill Township (Ontario Geological Survey, 1:31 680)
GDIF 518 Macmurchy Township (Ontario Geological Survey, 1:31 680)

Mines along highways 65 and 560

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log for mines along highways 65 and 560:

km	**0**	**Junction, Highway 65 (west) and Highway 11, west of New Liskeard; proceed west along Highway 65.**
km	**27.2**	**Junction, Highway 562.**
km	**34.9**	**Granitic rocks are exposed on both sides of Highway 65.**
km	**64.8**	**Elk Lake village, at junction of Highway 560 on the east side of Elk Lake, a broadening of the Montreal River. This is the turnoff to Moose Horn (page 69). Ethel Copper (page 69) and Jackpot (page 71) mines. The road log continues over the bridge.**
km	**65.6**	**Junction, highways 560 and 65; road log continues along Highway 560. Highway 65 leads to Mother-Lode (page 71) and Hubert Lake mines (page 72).**

km	66.3	Proterozoic conglomerate in *roadcut* on right.
km	68.8	Trail on right leading to Bermead mine (page 72).
km	69.0	*Roadcuts*. Reddish and greenish arkosic sandstone is exposed on both sides of the highway. This rock is of Proterozoic age and is exposed at intervals for the next 18 km.
km	72.9	Junction, road on right leading north to Boland Lake and to North American Silver mine (page 73), Otisse mine (page 73), Mapes Johnston mine (page 74).
km	86.7	The highway is bordered on each side by steep-walled ridges of arkosic sandstone.
km	87.8	Longpoint Lake on right.
km	89.0	Junction, Beauty Lake Road on left leading to the Kell mine (page 74) and to the Hudson Bay mine (page 75).
km	89.9	Turnoff (right) to the shore of Longpoint Lake.
km	95.6	Highway cuts through a ridge composed of Nipissing diabase of Proterozoic age.
km	96.8	Trail on right to Wigwam mine (page 76).
km	96.9	Trail on left leads about 30 m to an adit on the west side of a diabase ridge; pyrite, chalcopyrite, chlorite, quartz crystals (microscopic, in massive quartz), and calcite are found in the dumps.
km	97.0	Bridge at Lost Lake.
km	97.7	Buff sandstone of Huronian age is exposed on right.
km	98.9	Conglomerate of Huronian age is exposed on right.
km	100.9	Leroy Lake on right, with Coleroy mine on its shore (page 78).
km	101.0	Trail on right to Coleroy mine. Volcanic rocks of Archean age outcrop along the highway.
km	102.0	Diabase in *roadcut*.
km	102.5	Turnoff (right) to Morrison mine (page 78).
km	103.8	*Gravel pit* on right. White calcite (fluoresces pink under ultraviolet rays) occurs in a vein cutting diabase exposed along the wall of the pit.
km	104.1	Junction (on right), road to Miller Lake and to Walsh mine (page 79).
km	105.1	Junction, road on right leads to Miller Lake O'Brien mine (page 80), Bonsall mine (page 81), Millerett mine (page 81), Castle mine (page 82), and Capitol mine (page 83).
km	106.3	Conglomerate is exposed on both sides of the highway.
km	107.6	Gowganda, at a sharp bend in the highway.
km	108.6	The knoll on right is composed of Huronian (Proterozoic) conglomerate.
km	108.8	Gowganda Lake on left.

km	**110.1**	Junction, Edith Lake Road on right.
km	**113.6**	*Roacuts*. Diabase is exposed on both sides of the highway.
km	**116.2**	Junction, road on left leading to Milner Lake and to Mann mine (page 83), Boyd Gordon mine (page 84), Reeve-Dobie mine (page 85), Bartlett mine (page 86), and South Bay mine (page 86).
km	**119.2**	Firth Lake on right.
km	**124.4**	Bridge over Wapus River. Diabase is exposed in *roadcuts* at both ends of the bridge.
km	**125.0**	The highway cuts through an esker.
km	**126.5**	Junction, road on right leading to the West Montreal River.
km	**127.4**	Bridge over Duncan Lake. The eastern shore of the lake is underlain by diabase, the western shore, by volcanic rocks.
km	**129.2**	Turnoff to Breeze Creek camp.
km	**129.7**	Junction, single-lane road on right leading to Tyranite mine (page 87).
km	**132.2**	Dark grey volcanic rocks of Archean age in *roadcuts*.
km	**132.4**	Porphyry Lake on left.
km	**135.2**	Junction, trail on left to Matona mine (page 89).
km	**136.3**	Bridge over Hydro Creek.
km	**138.0**	Grey volcanic rock with surface coatings of calcite and epidote visible in *roadcut*.
km	**140.0**	Causeway across Houston Lake.
km	**143.4**	Bridge over Shining Tree Creek.
km	**144.6**	Junction, road on left leading to Gay Lake.
km	**146.7**	Bridge over West Montreal River.
km	**147.5**	Junction, Grassy Lake Road on right.
km	**150.8**	Causeway across Michiwakenda Lake.
km	**151.7**	Ronda mine on left (page 89).
km	**152.4**	Junction, trail on left leading to West Tree mine (page 90), Saville-McVittie mine (page 92), and McIntyre-MacDonald occurrence (page 92).
km	**160.1**	Village of Shining Tree.

Maps (T): 31 M Ville-Marie
41 P Gogama
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km	110.1	Junction, Edith Lake Road on right.
km	113.6	*Roadcuts*. Diabase is exposed on both sides of the highway.
km	116.2	Junction, road on left leading to Milner Lake and to Mann mine (page 83), Boyd Gordon mine (page 84), Reeve-Dobie mine (page 85), Bartlett mine (page 86), and South Bay mine (page 86).
km	119.2	Firth Lake on right.
km	124.4	Bridge over Wapus River. Diabase is exposed in *roadcuts* at both ends of the bridge.
km	125.0	The highway cuts through an esker.
km	126.5	Junction, road on right leading to the West Montreal River.
km	127.4	Bridge over Duncan Lake. The eastern shore of the lake is underlain by diabase, the western shore, by volcanic rocks.
km	129.2	Turnoff to Beaver Creek camp.
km	129.7	Junction, single-lane road on right leading to Tyranite mine (page 87).
km	132.2	Dark grey volcanic rocks of Archean age in *roadcuts*.
km	132.4	Porphyry Lake on left.
km	135.2	Junction, trail on left to Matona mine (page 89).
km	136.3	Bridge over Hydro Creek.
km	136.6	Grey volcanic rock with surface coatings of calcite and epidote visible in *roadcut*.
km	140.5	Causeway across Houston Lake.
km	143.4	Bridge over Shining Tree Creek.
km	144.6	Junction, road on left leading to Gey Lake.
km	146.7	Bridge over West Montreal River.
km	147.8	Junction, Granny Lake Road on right.
km	150.8	Causeway across Michiwakenda Lake.
km	151.7	Ronda mine on left (page 89).
km	152.6	Junction, trail on left leading to West Tree mine (page 90), Saville-McVittie mine (page 92), and McIntyre-MacDonald occurrence (page 92).
km	155.1	Village of Shining Tree.

Maps (T): 31 M Ville-Marie
41 P Gogama
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Moose Horn mine

Nickeline, cobaltite, native bismuth, pyrite, calcite (fluoresces pink under long ultraviolet rays), chlorite, epidote (crusts on diabase), annabergite, and erythrite were found in dumps near the main shaft of this property. Native silver and maucherite have been reported. Ore-bearing veins cut diabase and red aplite. Some high grade ore was encountered during mining operations and a trial shipment of 2.7 t of ore was made in 1910.

The mine was operated in 1908 by Charles Gifford, and between 1909 and 1914 by Moose Horn Mines Limited. It consists of a main shaft about 38 m deep and two other shafts. It was the first property in the Elk Lake area to be equipped with a boiler and hoist, and to use a power drill. The site of the original silver mineralization discovery in the Elk Lake area is approximately 2.4 km east of this mine and about 1.5 km south of Highway 560. The mine is about 1 km east of Elk Lake. See Map 7, No. 7, on page 70.

Road log from Elk Lake:

km	0	Junction, highways 65 and 560 at the bridge over Elk Lake narrows (**km 64.8**, see road log on page 66); proceed north onto Highway 560.
	1.5	Trail (on left) to Moose Horn mine (Main shaft) opposite diabase rock exposure on right (south) side of highway. The mine is in a wooded area, 60 m north of the highway.

Refs.: 38 p. 126; 117 p. 30-31; 207 p. 360; 217 p. 119, 154.

Maps (T): 41 P/9 Elk Lake
(G): 2151 Mickle and James townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Ethel Copper mine

Chalcopyrite, bornite, and specular hematite in calcite veins in Nipissing diabase.

The deposit was opened in 1960 by Ethel Copper Mines Limited. An inclined adit was driven 107 m into the east side of a hill. Production in 1962 and 1966 amounted to 200 739 kg of copper, 188 515.3 g of silver, and 3421.3 g of gold.

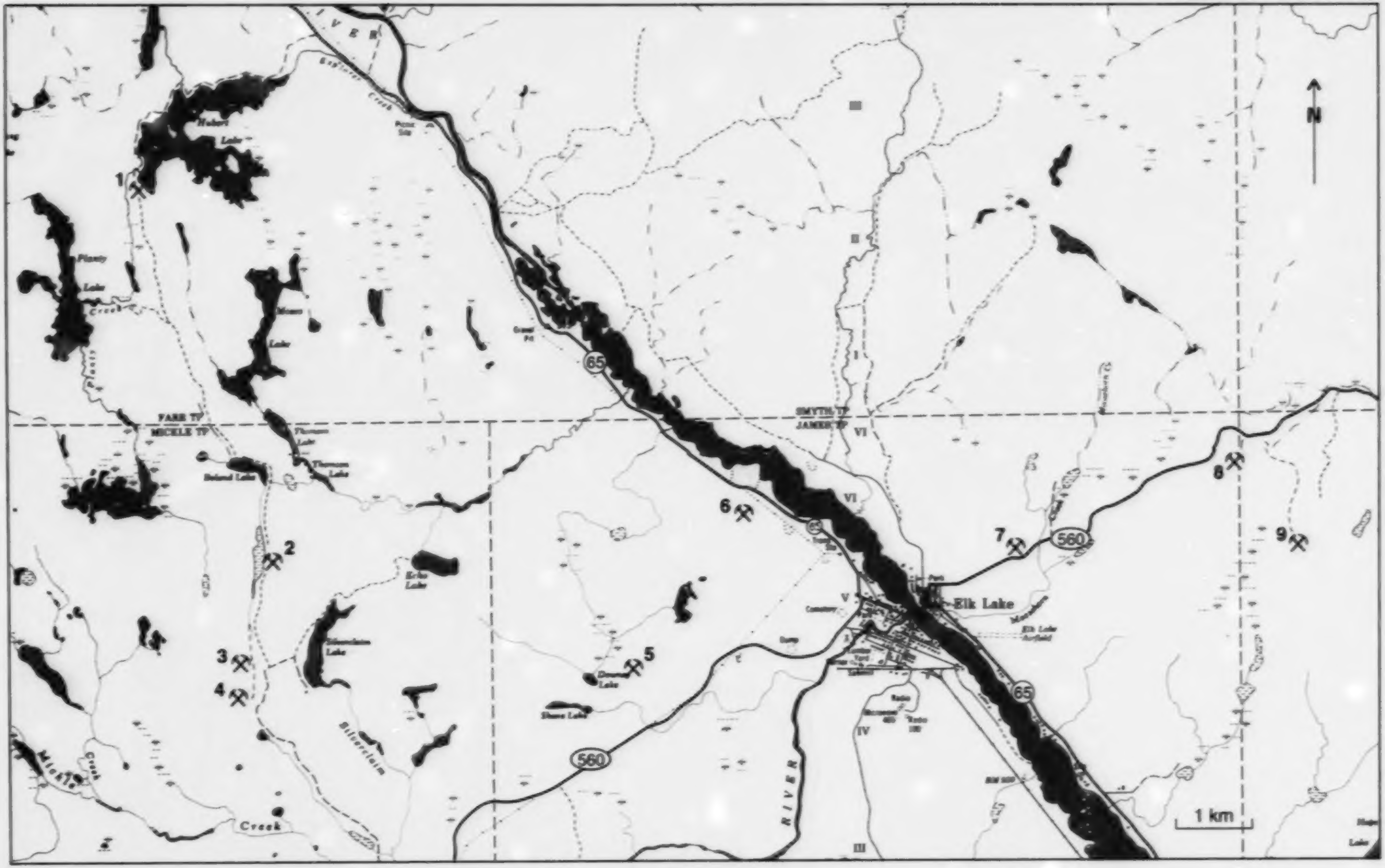
The mine is about 5 km east of Elk Lake. See Map 7, No. 8, on page 70.

Road log from Elk Lake:

km	0	Elk Lake, at the junction of highways 65 and 560; proceed north along Highway 560 toward Charlton. This junction is **km 64.8** on the road log for highways 65 and 560 on page 66.
	1.5	Trail on left leading to Moose Horn mine; continue east along Highway 560.
	5.2	Junction, mine road on right. Proceed south along this road for about 400 m to the adit.

Refs.: 117 p. 25-26; 170 p. 346; 172 p. 360.

Part of 41 P/9 & 41 P/16



Map 7. Elk Lake area

1. Hubert Lake mine 2. Mapes Johnston mine 3. Otisse mine 4. North American Silver mine
5. Bermead mine 6. Mother-Lode mine 7. Moose Horn mine 8. Ethel Copper mine
9. Jackpot mine

Maps (T): 41 P/9 Elk Lake
(G): 2151 Mickle and James townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Jackpot mine

Some very high grade native silver was extracted from this deposit. The silver occurred in calcite veins in aplite associated with Nipissing diabase.

The deposit was opened by a shaft sunk to a depth of 32 m in 1909. In 1952, Silver Jackpot Mines Limited dewatered the shaft, built a new headframe, and completed the mine road from Highway 560. A diamond drilling and trenching operation was carried out in 1961-1963 by Big Jackpot Mines Limited. In 1978-1980, Northern Silver Fox Mines Limited explored the workings at the bottom of the shaft and drove an adit eastward to the shaft.

The mine is 7 km east of Elk Lake. See Map 7, No. 9, on page 70.

Road log from Elk Lake:

km	0	Elk Lake, at the junction of highways 65 and 560; proceed north along Highway 560 toward Charlton. This junction is **km 64.8** on the road log for highways 65 and 560 on page 66.
	1.5	Trail on left leading to Moose Horn mine; continue east along Highway 560.
	5.2	Junction, road to Ethel Copper mine; continue east along Highway 560.
	5.5	Junction, Jackpot mine road on right; proceed south along this road.
	7.0	Jackpot mine.

Refs.: 53 p. 118; 98 p. 119-120; 170 p. 358.

Maps (T): 41 P/9 Elk Lake
(G): 50J Bryce-Robillard area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Mother-Lode mine

Nuggets of native silver weighing over 23 kg were extracted from a weathered calcite vein by the owner of this claim, Herbert Gates, in 1908. The nuggets, totalling several hundred pounds in weight, were obtained from a test pit, 4.5 m deep, at the top of a hill overlooking Elk Lake. In other veins found on the property, native silver was associated with argentite, cobalt minerals, chalcopyrite, and specularite in calcite.

In 1908, the property was sold to the Mother-Lode Mining Company Limited, which drove an adit 111 m into the ridge below the discovery vein. A 30 m shaft was put down near the portal of the adit; there are two trenches on the claim. Exploration of the deposit ended in 1911.

The deposit is along a ridge on the west side of Elk Lake and about 2 km northwest of the village of Elk Lake; it is 185 m southwest of Highway 65 at a point 1.9 km from its junction with Highway 560 at Elk Lake (**km 65.6**, page 66). See Map 7, No. 6, on page 70.

Refs.: 44 p. 133; 63 p. 53; 117 p. 33-34; 217 p. 479.

Maps (T): 41 P/9 Elk Lake
(G): 2151 Mickle and James townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Hubert Lake (Roy) mine

Native silver, cobaltite, chalcopyrite, and bornite occur in calcite veins in Nipissing diabase. Erythrite is common.

This deposit was originally staked in 1907 as the Currie claim. It was the most promising of the rich silver-cobalt veins discovered near Hubert Lake. Considerable work was reported to have been done in 1908. In 1913, Forest City Mines Syndicate was involved in developing the deposit from a shaft sunk to 30 m. Two additional shafts were sunk to 23 m and 38 m respectively. Between 1950 and 1954, Roy Silver Mines Limited worked the deposit, deepening the original shaft to 119 m. A flotation mill operated on the site for a few months and treated 2242 t of ore. Production was estimated at 58 722.5 g of silver.

The mine is at the southwestern end of Hubert Lake, about 14 km northwest of Elk Lake. See Map 7, No. 1, on page 70. Access is by a road, 4 km long, leading west from Highway 65 at a point 10.5 km north of the junction of highways 65 and 560 at Elk Lake. This junction is **km 65.6** on the road log for highways 65 and 560 on page 66.

Refs.: 40 p. 53; 60a p. 18-19; 170 p. 343; 181 p. 155; 217 p. 379.

Maps (T): 41 P/16
(G): 16F Part of Montreal River and Temagami Forest Reserve, district of Nipissing, Ontario (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Bermead (Downey) mine

Native silver, chalcopyrite, nickeline, cobalt minerals, bornite, and specularite have been reported from calcite veins cutting aplite and diabase at this property originally staked by Larry Downey. In 1908, 30 or 40 bags of silver ore were extracted from the deposit. Between 1909 and 1911, the Tee Arr Mining Company sank some shafts on the east side of a diabase hill, and in 1914 Larry Downey removed 9 t of high grade ore from an opencut, this being the first shipment from the Elk Lake area since 1910. The workings consist of four shafts (the deepest being 52 m and 21 m) and several opencuts in a wooded area on the east side of a long ridge.

The mine is about 4 km west of Elk Lake. Access is by a trail about 800 m long, leading north from Highway 560 at **km 68.8** (see road log for highways 65 and 560 on page 67). See Map 7, No. 5, on page 70.

Refs.: 117 p. 22-23; 181 p. 155; 217 p. 25, 637a

Maps (T): 41 P/9 Elk Lake
(G): 2151 Mickle and James townships, Timiskaming district (Ontario Geological Survey, 1:31 680)

Maps (G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

North American Silver mine

Native silver occurred in calcite and aplite veins in diabase. Other minerals found in the deposit include smaltite, galena, chalcopyrite, hematite (specularite), and barite.

The deposit was originally worked between 1908 and 1910 by North American Silver Mining Company Limited. The workings include an adit driven 61 m into the east face of a diabase cliff and three shallow shafts located within 150 m east and northeast of the adit. The mine is about 12 km west of Elk Lake. See Map 7, No. 4, on page 70.

Road log from Highway 560 at **km 72.9** (see road log for highways 65 and 560 on page 67):

km	0	Proceed north along the road to Boland Lake.
	4.0	Junction, trail on left; proceed west along this trail for about 100 m to the mine.

Refs.: 33 p. 108-109; 117 p. 49-50; 170 p. 350.

Maps (T): 41 P/9 Elk Lake
(G): 2151 Mickle and James townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Otisse (Welsh) mine

Silver-bearing calcite veins cutting diabase were discovered on this property by the Otisse brothers. Nuggets of native silver were found in calcite and leaf silver in the host rock.

During the winter of 1908-1909, mining equipment, buildings, and camps were installed by the Otisse Mining Company, which acquired the property in 1908. A shaft was put down to 49 m, but in spite of the very rich surface showings, the deposit did not live up to early expectations and operations ceased in 1910. In 1963, Marjortrans Oil and Mines Limited reopened the mine and extracted some high grade ore. G.S. Welsh of Matachewan acquired the property in 1964 and Welsh Silver Mines Limited was formed in 1968 to develop it. A total of about 90 t of ore was test milled in 1969. Silver Lake Resources Inc. carrried out underground exploration between 1983 and 1985.

The mine is adjacent to the Boland Lake road, 12.6 km west of Elk Lake. See Map 7, No. 3, on page 70.

Road log from Highway 560 at **km 72.9** (see road log for highways 65 and 560 on page 67):

km	0	Proceed north along the road to Boland Lake.
	4.0	Junction, trail on left leading west to North American Silver mine; continue toward Boland Lake.
	4.5	Junction, trail on left leading west to Otisse mine.

Refs.: 38 p. 127; 44 p. 133-134; 117 p. 50, 51; 162 p. 119-120; 217 p. 379, 637a; 219 p. 735; 251 p. 339.

Maps (T):41 P/9 Elk Lake
(G): 2151 Mickle and James Townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Mapes Johnston mine

Native silver, argentite, and cobaltite were associated with chalcopyrite, bornite, nickeline, and hematite (specularite) in calcite veins in Nipissing diabase. Alloclasite and native bismuth have been reported.

The deposit was originally worked between 1912 and 1914 by Mapes Johnston Mining Company Limited; a small shipment of high grade ore was made. The mine was later worked at various times by several developers, including Silver Lake Resources Incorporated between 1980 and 1985. It consists of underground workings extending to a depth of 114.7 m, a prospect shaft to 27 m, and several trenches. The mine is 13.7 km west of Elk Lake. See Map 7, No. 2, on page 70.

Road log from Highway 560 at **km 72.9** (see road log for highways 65 and 560 on page 67):

km	0	Proceed north along the road to Boland Lake.
	4.0	Junction, trail on left to North American Silver mine; continue toward Boland Lake.
	4.5	Junction, trail on left to Otisse mine; continue toward Boland Lake.
	5.6	Junction, road on right leading east 300 m to Mapes Johnston mine.

Refs.: 33 p. 109; 117 p. 42-43; 170 p. 349.

Maps (T): 41 P/9 Elk Lake
(G): 2151 Mickle and James townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Kell mine

Native silver occurred as scales with argentite and smaltite in calcite-quartz veins cutting diabase at this former silver-cobalt producer. Good specimens of millerite have been reported from a pit 60 m south of the shaft. Other minerals found in the deposit include nickeline, magnetite, specularite, and pyrrhotite.

The deposit was discovered and originally staked in 1909 by Hugh Kell. After having encountered loose fragments of the rock containing silver-bearing veins elsewhere on the ridge, he located an argentiferous calcite vein cutting diabase exposed on the east side of a ridge overlooking Shack Lake. The deposit was worked in 1919-1920 by J.G. Smith, a former governor of Vermont; development consisted of an inclined shaft sunk to 32 m, an adit, and some opencuts. A 718 kg shipment of ore made in 1920 from an opencut 215 m north of the shaft yielded 50 418 g of silver and 115 kg of cobalt, the only production recorded from this mine. Subsequent investigations of the deposit were made by Silver Chest Mines Limited in 1947 and by Ourgold Mining Company Limited in 1966.

The mine is about 43 km southwest of Elk Lake. See Map 8, No. 17, on page 77. Access is via a 4 km trail that leads south from the Beauty Lake Road at a point 15.3 km south of its junction with Highway 560 at **km 89.0** (see road log for highways 65 and 560 on page 67).

Refs.: 25 p. 4, 58-60; 122 p. 44-46; 170 p. 372.

Maps (T): 41 P/10 Gowganda
(G): 2208 Leith, Charters, and Corkill townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Hudson Bay (Rustex) mine

The ore consisted of native silver associated with argentite, smaltite, skutterudite, loellingite, safflorite, nickeline, galena, chalcopyrite, and cobaltite in calcite veins cutting diabase.

This mine comprises two original properties: the Hudson Bay mine and the adjoining Silverado mine. Silver ore was discovered in 1908 by Dan O'Gorman on property later acquired by the Timiskaming and Hudson Bay Mining Company which sank three shafts during its operations from 1910 to 1913. In 1920, Silverado Mining Company Limited sank a shaft to a depth of 30.5 m on the northeast claim. Subsequently, the properties were operated jointly by various companies, production having been recorded by Pioneer Prospectors Consolidated Mines Limited (1929), Silverado-Gowganda Mines, Limited (1936), Silver Valley Mines Limited (1937-1938), and Rustex Mining Corporation (1964-1966). Total production amounted to 256 kg of cobalt and 2 494 025 g of silver.

The mine consists of four shafts, the deepest being 68.5 m, and is 57 km southwest of Elk Lake. See Map 8, No. 16, on page 77.

Road log from Highway 560 at **km 89.0** (see road log for highways 65 and 560 on page 67):

km	0	Junction at **km 89.0**; proceed onto Beauty Lake Road.
	12.7	Junction; proceed along road on right.
	13.5	Turnoff (left) to Beauty Lake; continue straight ahead.
	15.3	Turnoff (left) to Kell mine; continue straight ahead.
	23.2	Junction; continue straight ahead.
	23.6	Bridge over Montreal River.
	32.2	Hudson Bay (Rustex) mine shaft No. 4 on right; to reach other workings, continue straight ahead.
	32.4	Shaft No. 3 on left. This was the main production shaft.
	32.5	Shaft No. 2 on left.
	32.75	Shaft No. 1 on left.

Refs.: 25 p. 57-58; 119 p. 31-32, 37-39; 170 p. 388-389; 187 p. 109; 203 p. 70; 219 p. 668.

Maps (T): 41 P/7 Smoothwater Lake
41 P/10 Gowganda
(G): 2208 Leith, Charters, and Corkill townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Wigwam mine

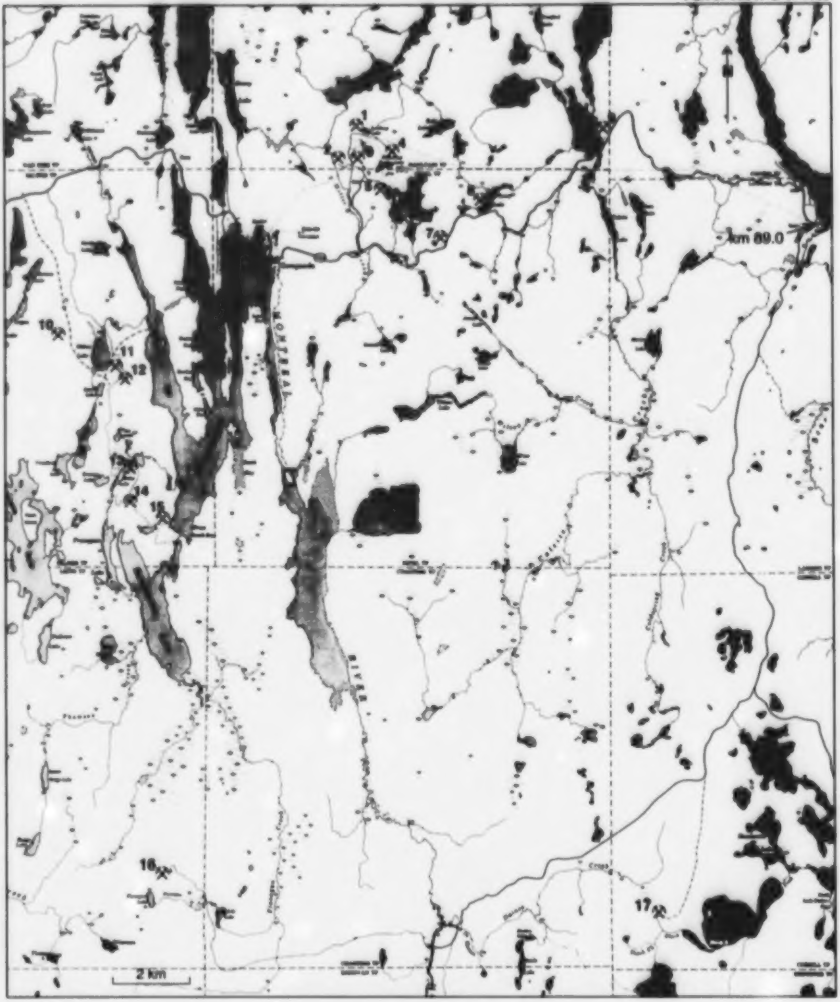
During exploration of this deposit, rich pockets of native silver were found in calcite veins cutting diabase. The veins were explored in 1922 by Wigwam Mining Company, and between 1923 and 1927 by Wigwam Silver Mines Limited. The development consisted of an adit driven 244 m into a ridge on the east shore of Lost Lake, about 6 m above the water level. A shipment of ore containing 27 868.3 g of silver was made in 1923. Additional exploration work was done in 1962 by Tormont Mines Limited.

The mine is on the east shore of Lost Lake, 32 km west of Elk Lake. See Map 8, No. 9, on page 77. Access is by a trail, 425 m long, leading north from Highway 560 at **km 96.8**, which is 0.2 km east of the Highway 560 bridge at Lost Lake (see road log for highways 65 and 560 on page 67).

Refs.: 25 p. 39; 122a p.97; 170 p. 384-385.

Plate 15

Dendritic native silver, Hudson Bay mine. The specimen measures 8 cm from left to right. National mineral Collection specimen 67324. (GSC 1993-236A)



Map 8. Gowganda area

1. Castle mine
2. Bonsall mine
3. Millerett mine
4. Capitol mine
5. Miller Lake O'Brien mine
6. Walsh mine
7. Morrison mine
8. Coleroy mine
9. Wigwam mine
10. Crews McFarlan-Hewitt Lake occurrence
11. Boyd Gordon mine
12. Mann mine
13. Reeve-Dobie mine
14. Bartlett mine
15. South Bay mine
16. Hudson Bay mine
17. Kell mine

Maps (T): 41 P/10 Gowganda
(G): 2349 Haultain and Nicol townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Coleroy (Collins) mine

This silver-cobalt-nickel deposit on the southwestern shore of Leroy Lake was originally explored by P. Howard Collins of Gowganda from 1918 to 1922; one shaft near the shore of the lake was sunk to a depth of about 275 m and another, 110 m north of it, to about 15 m. Exploration was continued from 1925 to 1927 by Coleroy Gowganda Mines Limited, and the main exploration shaft was deepened to 207 m. No ore was produced.

The mineralization at the Coleroy mine consisted of native silver, argentite, cobalt, and nickel minerals, with chalcopyrite and pyrite in calcite-quartz veins cutting diabase. Maucherite (temiskamite), a bronze massive mineral with a somewhat radiating structure, has been reported associated with nickeline; smaltite, cobaltite, and breithauptite were associated with it. Good crystals of cobaltite were found with nickeline.

The first discovery of native silver in the Gowganda area was made early in 1908 on the Leroy claims southwest of Leroy Lake and on claims northwest of Miller Lake. The Leroy deposit was developed by the Leroy Lake Syndicate, which sank three shafts to depths of 30.5 m, 13.7 m, and 10.7 m. There was no production. The dump is visible from Highway 560 at **km 100.9**, see page 67.

The mine is about 36 km west of Elk Lake. See Map 8, No. 8, on page 77. Access is by a trail, approximately 320 m long, leading north from Highway 560 at **km 101** (see road log for highways 65 and 560 on page 67).

Refs.: 16 p. 1, 20; 25 p. 44-46; 39 p. 118; 170 p. 401; 186 p. 152; 188 p. 124; 191 p. 156; 192 p. 168; 203 p. 76-77; 207a p. 110.

Maps (T): 41 P/10 Gowganda
(G): P374 Nicol Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)
1955-3 Gowganda silver area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Morrison mine

A mass of silver weighing over 22 kg was recovered from this property in the early days. The deposit was originally explored in 1909 by trenching conducted by Major Morrison of Ottawa. Shafts were sunk in the following years disclosing a calcite vein containing native bismuth and a rich streak of native silver. The veins occurred in diabase.

Underground development of the deposit was conducted by various companies, notably Tonapah Canadian Mines Limited (1925-1927), which explored the deposit to a depth of 146 m. In 1929, Morrison Mines Limited renewed exploration and brought the mine into production in 1930, continuing to 1936. Production was resumed from 1952 to 1954 by New Morrison Mines Limited. Total production reached about 22 363 057 g of silver and 9966 kg of cobalt.

Epidote and dark green blade-like masses of amphibole (probably actinolite) associated with calcite in diabase were found in the dumps. Erythrite, stromeyerite, and pyrite were also noted. Minerals, other than ore minerals, reported from the deposit include: pearceite intergrown with stromeyerite, axinite as purple prismatic aggregates (2 to 3 cm in diameter), and andradite garnet grains in quartz.

The mine is 38 km west of Elk Lake. See Map 8, No. 7, on page 77. The main shaft (175 m deep) is on the north side of Highway 560 at **km 102.5** (see road log for highways 65 and 560 on page 67). Access is by a single-lane road about 90 m long. The headframe has been removed and the dumps were being levelled in 1972.

Refs.: 39 p. 119; 90 p. 249; 130 p. 24, 35; 144 p. 206, 208-209; 170 p. 404-405; 174 p. 158-159; 192 p. 183; 219 p. 766.

Maps (T): 41 P/10 Gowganda
(G): P374 Nicol Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)
1955-3 Gowganda silver area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Walsh (Tonapah) mine

Native bismuth, nickeline, chalcopyrite, and hematite were associated with silver-cobalt ore minerals in calcite veins cutting diabase at this former producer. Walsh Mines Limited began exploration of the deposit in 1913 from a shaft sunk to a depth of 146 m. Tonapah Canadian Mines Company brought the mine into production in 1924 and continued to 1927. Minor production was recorded in 1940. A total of close to 15 551 500 g of silver and about 1585 kg of cobalt was removed from the deposit. The property was leased in 1967, by Siscoe Metals of Ontario Limited and underground workings were explored from the No. 6 shaft of the Miller Lake O'Brien mine.

The mine is on the south shore of Miller Lake about 40 km west of Elk Lake. See Map 8, No. 6, on page 77. It is reached by a road 0.9 km long leading north from Highway 560 at **km 104.1** (see road log for highways 65 and 560 on page 67).

Refs.: 25 p. 3; 130 p. 27; 170 p. 408-409.

Maps (T): 41 P/10 Gowganda
(G): P374 Nicol Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Miller Lake mines

Nearly all the silver from the Elk Lake-Gowganda area was obtained from mines on the northwest side of Miller Lake; cobalt and nickel were also won. To the end of 1972, the mines produced a total of 793 172.8 kg of silver from 1 041 112 t of ore milled.

Within a few years of their discovery in 1908, rich, promising surface showings near Miller Lake fulfilled the early optimistic expectations of miners, production being sustained annually from 1910 to 1972 when the known ore was mined out and operations ceased. The largest producers were the Miller Lake O'Brien mine, the Capitol mine, and the Castle mine, in that order.

Ore was processed at the 363 t per day mill at the Miller Lake O'Brien mine. Common ore minerals in the deposits were native silver, argentite, smaltite, skutterudite, loellingite, safflorite, cobaltite, nickeline, and native bismuth; they occurred in calcite veins.

The following mines in the Miller Lake area are described: Miller Lake O'Brien mine, Bonsall mine, Millerett mine, Castle (Castle-Trethewey) mine, and Capitol mine.

Miller Lake O'Brien mine

This mine was the longest continuously producing silver mine in Ontario. Miller Lake O'Brien Mines Limited began production in 1910, two years after the discovery by Messrs. Cartwright and LeHeup of rich surface showings that were regarded as the most promising veins found in the district to that time; the deposit was then known as the Gates claim. Mining operations were begun in 1909 by Miller Lake Mining Company, and continued from 1910 to 1939 by Miller Lake O'Brien Mines Limited, from 1940 to 1944 by various concerns under lease, and from 1945 to 1969 by Siscoe Metals of Ontario Limited. The mine was serviced by several shafts with extensive underground workings reaching a depth of 494 m. Production from 1910 to 1969 amounted to approximately 1 208 351 550 g of silver, 35 560 kg of cobalt, 33 067 kg of copper, and 5889 kg of nickel.

Ore minerals occurred in calcite veins cutting diabase. Dendritic native silver occurred in diabase. Vugs containing polybasite-pearceite associated with proustite, xanthoconite, acanthite, stephanite, and pyrargyrite have been reported from the veins. Chalcopyrite, galena, pyrite, and sphalerite have also been reported. Microscopic crystals of cobaltite occur with radiating loellingite-safflorite. The mine is 42.5 km west of Elk Lake. See Map 8, No. 5, on page 77.

Road log from Highway 560 at **km 105.1** (see road log for highways 65 and 560 on page 67):

km	0	At junction, proceed onto road to O'Brien.
	2.2	Turnoff (right) to Miller Lake O'Brien mine.

Plate 16

Miller Lake O'Brien mine, 1922. (National Archives of Canada PA 15959)

Refs.: 16 p. 1; 25 p. 27-32; 63 p. 11, 46; 130 p. 35; 144 p. 208; 170 p. 402-403; 207a p. 110, 332; 217 p. 447; 254 p. 344.

Maps (T): 41 P/10 Gowganda
(G): P374 Nicol Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Bonsall mine

Although some very rich ore was removed during early mining operations, this mine did not become one of the great producers of the area. Ore minerals occurred in quartz-calcite veins cutting diabase; orange barite has been reported from the veins. In early exploration of the showings, crystallized native silver was found in a weathered calcite vein.

The deposit was discovered in 1908 by Percy Bonsall. The following year, Messrs. Sifton and O'Brien sank a shaft, installed a plant, and removed some very rich ore. Subsequent operations resulting in silver production were conducted by Bonsall Mines, Limited in 1910 and 1920, and by Siscoe Metals of Ontario Limited between 1966 and 1969.

The mine is 43 km west of Elk Lake. See Map 8, No. 2, on page 77. It consists of several shafts, the deepest being 157 m. Total ore mined amounted to about 7 962 368 g of silver, the bulk of it recovered in 1967 and 1968.

Road log from Highway 560 at **km 105.1** (see road log for highways 65 and 560 on page 67):

km	0	At junction, proceed onto road to O'Brien.
	2.2	Turnoff (right) to Miller Lake O'Brien mine.
	2.7	Bonsall mine on left; Millerett mine on right.

Refs.: 16 p. 12-13; 25 p. 25-27; 39 p. 117; 90 p. 249; 159 p. 163; 160 p. 152; 161 p. 119; 162 p. 116; 163 p. 9, 11; 170 p. 374-375; 188 p. 123; 189 p. 57; 217 p. 447.

Maps (T): 41 P/10 Gowganda
(G): P518 Haultain Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)
1955-3 Gowganda silver area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Millerett mine

Phenomenally rich ore was encountered at this deposit, which was originally staked in 1908 as the Blackburn claim. One vein 5 cm wide and 45.7 m long yielded about 15 551 500 g of silver. Ore assaying over 342 850 g/t of silver was reported. In spite of the spectacularly rich ore recovered during early mining operations, production was short-lived and amounted to 19 029 499 g of silver and 2265 kg of cobalt.

Most of the production was obtained from a vein in conglomerate, the remainder coming from veins cutting diabase. One vein in conglomerate exposed by an opencut contained sheets and nuggets (reported to be several centimetres long) of native silver associated with smaltite.

Millerett Silver Mining Company operated the mine from 1909 to 1912 using an adit and several shafts; all production was obtained from 1910 to 1912, the first year's output accounting for over half the total. The mine was the district's largest producer at the time. The deposit was owned by Miller Lake O'Brien Mines Limited from 1913 to 1939 and has been owned by Siscoe Metals of Ontario Limited since 1945. The mine is opposite the Bonsall mine (see page 81). See Map 8, No. 3, on page 77.

Refs.: 16 p. 16; 19 p. 182-183; 25 p. 3; 33 p. 111; 130 p. 35; 170 p. 382-383.

Maps (T): 41 P/10 Gowganda
(G): P518 Haultain Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)
1955-3 Gowganda silver area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Castle (Castle-Trethewey) mine

The silver-cobalt-bearing veins at this mine occur in diabase and greenstone; axinite, epidote, xanthoconite, pyrargyrite, and specularite have been reported from the veins as well as an unusual porcelain-like green gangue (a mixture of calcite and amphibole) containing native silver with skutterudite and safflorite in dendritic form. During early mining operations, loose fragments of native silver up to 38 cm across were recovered from an oxidized high grade vein, and leaf silver was also found.

Castle Mining Company Limited originally explored the deposit in 1917. Castle-Trethewey Mines Limited operated the mine continuously from 1920 to 1931, producing nearly 202 169 500 g of silver and about 135 900 kg of cobalt. The property was acquired by McIntyre Porcupine Mines Limited in 1959, and by Siscoe Metals of Ontario Limited in 1967. It was operated by Agnico-Eagle Mines Limited from 1979 to 1988. Underground workings extended to a depth of 435 m. The mine is 3.4 km west of Elk Lake. See Map 8, No. 1, on page 77.

Road log from Highway 560 at **km 105.1** (see road log for highways 65 and 560 on page 67):

km	0	At junction, proceed onto road to O'Brien.
	2.2	Turnoff (right) to Miller Lake O'Brien mine.
	2.7	Bonsall mine on left; Millerett mine on right.
	3.1	Castle (Castle-Trethewey) mine.

Refs.: 23 p. 30-31; 25 p. 26-27, 33-38; 130 p. 31; 170 p. 378-379; 185 p. 129; 203 p. 75; 207a p. 284, 409.

Maps (T): 41 P/10 Gowganda
(G): P518 Haultain Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)
1955-3 Gowganda silver area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Capitol mine

The discovery vein on this property, originally known as the Kilpatrick claim, was exposed in the early days by trenching over a distance of 214 m. At the time (1908), it was the longest vein known in the Gowganda area; it carried massive smaltite and nickeline with only a little native silver in conglomerate. Subsequent discoveries were rich in silver, including one oreshoot that produced over 24 882 400 g of silver.

The Kilpatrick vein was staked in 1908. A shaft was put down to a depth of 250 m by Capitol Silver Mines Limited during exploration in 1924-1925. Castle-Trethewey Mines Limited operated the mine from 1949 to 1959. McIntyre Porcupine Mines Limited acquired the mine in 1959 and continued mining operations until 1966. Siscoe Metals of Ontario Limited leased the property in 1967 and undertook a program of exploration and development. The underground workings extend to a depth of 435 m and are connected to the main production shaft at the company's Miller Lake O'Brien mine, which also serviced the Capitol mine. Production from 1951 to 1971 amounted to about 335 912 400 g of silver, 94 592 kg of cobalt, and 8528 kg of nickel. The mine is 44.5 km west of Elk Lake. See Map 8, No. 4, on page 77.

Road log from Highway 560 at **km 105.1** (see road log for highways 65 and 560 on page 67):

km	0	At junction, proceed onto road to O'Brien.
	2.2	Turnoff (right) to Miller Lake O'Brien mine.
	2.7	Bonsall mine on left; Millerett mine on right.
	3.1	Castle (Castle-Trethewey) mine.
	4.2	Capitol mine.

Refs.: 16 p. 16; 25 p. 32-33; 130 p. 24, 26, 33; 157 p. 130-131; 161 p. 119; 170 p. 376-377.

Maps (T): 41 P/10 Gowganda

(G): P518 Haultain Township, district of Timiskaming (Ontario Geological Survey, 1:15 840)

1955-3 Gowganda silver area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:31 680)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Mann mine

This is the only mine in the Gowganda area from which crystals of native silver have been reported; octahedra and plates of silver forming a wedge averaging 10 mm wide were found protruding from a 7 cm wide decomposed calcite-quartz vein over a length of about 0.6 m. The vein was exposed along the face of a low diabase ridge where it was discovered by Robert Mann in August 1908; trenching revealed that it extended for several hundred metres with numerous concentrations of native silver. Reports of the discoveries of this and other phenomenally rich veins led to a prospecting rush in the area west of Gowganda Lake; production was obtained from a few of the deposits, but the oreshoots, being small and near the surface, were mined out within a few years.

At the Mann mine, loose slabs and nuggets of native silver leached from weathered near-surface veins were recovered during early mining operations. Skutterudite, smaltite, argentite, safflorite, loellingite, and cobaltite were associated with silver.

Mann Mines Limited undertook development of the deposit in 1909; several shafts were sunk (the deepest to 61 m) and production was recorded from 1912 to 1914 when operations ceased. Ore was processed at the Millerett mill. One ore shipment averaged 68 570 g/t of silver and contained gold worth $1.81/t. Siscoe Metals of Ontario Limited leased the property in 1952 and milled ore from the dumps. From 1968 to 1970, it conducted underground development of the former main shaft, constructed a new headframe and mined buildings, and mine some ore which was treated at its mill in O'Brien. Total production of about 3 701 257 g of silver (most of it obtained between 1912 and 1914) was the highest of any silver mine west of Gowganda Lake at the time.

The mine is about 57 km west of Elk Lake and 14.3 km southwest of Gowganda. See Map 8, No. 12, on page 77.

Road log from Highway 560 at **km 116.2** (see road log for highways 65 and 560 on page 68):

km	0	Junction, Highway 560 and Milner Lake Road; proceed south onto Milner Lake Road.
	3.8	*Crews McFarlan-Hewitt Lake silver occurrence* on right. This occurrence was explored by Crews-McFarlan Mining Company (1917-1919) and Hewitt Lake Mining Company (1920); a shaft, 45 m deep, is on the west side of the road at this point. See Map 8, No. 10, on page 77.
	5.4	Junction; proceed along the road on left leading east.
	5.7	Mann mine.

Refs.: 16 p. 16; 19 p. 185-186; 25 p. 51-53; 33 p. 101, 102-103; 109-110; 38 p. 95; 39 p. 118; 42 p. 124; 53 p. 120; 120 p. 101; 122a p. 70-74; 161 p. 120; 162 p. 116-117, 118; 170 p. 394-395; 182 p. 128; 251 p. 198.

Maps (T): 41 P/10 Gowganda

(G): P475 Milner Township, district of Timiskaming (Ontario Geological Survey, 1:31 680)

2348 Van Hise and Milner townships, Timiskaming district (Ontario Geological Survey, 1:31 680)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Boyd Gordon mine

High grade silver ore was discovered in an outcrop on this property in 1908. The ore, consisting of native silver and smaltite, occurred in calcite veins in diabase. The deposit was worked in 1909-1910 by Boyd Gordon Mining Company Limited. Crystals of native bismuth in calcite have been reported from the deposit, which was acquired by Mann Mines in 1912 and worked in conjunction with the Mann deposit. The workings consisted of an opencut and a shaft 45.7 m deep. About 145 499.8 g of silver were produced.

The mine is near the southeast end of Milner Lake, about 14.5 km southwest of Gowganda. See Map 8, No. 11, on page 77.

For access to the mine, follow the road log to the Mann mine; the Boyd Gordon shaft is 200 m north of the road at km 5.7.

Refs.: 16 p. 16; 122a p. 69-70; 170 p. 392-393, 411.

Plate 17

Boyd Gordon mine, about 1910. (GSC 1993-299)

Maps	(T):	41 P/10 Gowganda
	(G):	2348 Van Hise and Milner townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
		2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts (Ontario Geological Survey, 1:253 440)

Reeve-Dobie mine

The original discoveries of silver ore at this mine were among the most spectacular in the Gowganda mining camp. Some very rich ore, consisting of massive native silver and smaltite, was removed from calcite veins during initial exploration of the deposit in 1908. Vein outcrops of exceedingly rich ore: "a sheet of silver about the size of a hand protruded" from a vein 7 to 10 cm wide (Ref.: 16 p. 19). Most of this high grade ore was in near-surface veins and was removed from opencuts. Silver-bearing calcite veins occurred in diabase.

Underground development consisted of two shafts and an adit. The work was done between 1910 and 1920 by various concerns including Dobie Reeve Silver Mines Limited and Reeve-Dobie Mines Limited. Total production amounted to 2 755 228 g of silver.

The mine is between Reeve and Dobie lakes, about 17 km southwest of Gowganda. See Map 8, No. 13, on page 77.

Road log from Highway 560 at **km 116.2** (see road log for highways 65 and 560 on page 68):

km	0	Junction, Highway 560 and Milner Lake Road; proceed south onto Milner Lake Road.
	5.4	Junction. The road on left leads to the Boyd Gordon and Mann mines. Proceed south along the road on right.

km 7.8 Junction; proceed along the road on left.

8.3 Reeve-Dobie mine.

Refs.: 16 p.19; 25 p. 53; 122a p. 75; 170 p. 396-397.

Maps (T): 41 P/10 Gowganda
(G): 2348 Van Hise and Milner townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Bartlett mine

Spectacular showings of native silver were discovered on this property in 1908 by prospectors F. McIntosh and S. McLaughlin. The high grade ore consisted of massive native silver, smaltite, and argentite in calcite veins in diabase. Native silver was also found as scales, leaves, and sheets in aplite and in host diabase rock. Chalcopyrite and nickeline have also been reported.

The main workings consisted of a shaft 91.5 m deep and an opencut. The deposit was initially worked in 1909 by Bartlett Mining Company. From 1917 to 1919, Crews-McFarlan Mining Company operated the mine and produced 608 652.5 g of silver. Most of the production was from the opencut.

The mine is southeast of Dobie Lake, about 17.7 km southwest of Gowganda. See Map 8, No. 14, on page 77.

Road log from Highway 560 at **km 116.2** (see road log for highways 65 and 560 on page 68):

km 0 Junction, Highway 560 and Milner Lake Road; proceed south onto Milner Lake Road.

5.4 Junction. The road on left leads to the Boyd Gordon and Mann mines. Proceed south along the road on right.

7.8 Junction. The road on left leads to the Reeve-Dobie mine; proceed along the road on right.

9.1 Bartlett mine.

Refs.: 16 p. 18; 25 p. 49-50; 122a p. 68-69; 170 p. 390-391.

Maps (T): 41 P/10 Gowganda
(G): 2348 Van Hise and Milner townships, Timiskaming district (Onario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

South Bay mine

The ore consisted of native silver, argentite, smaltite, and nickeline in calcite veins in diabase. Some high grade ore was mined from opencuts. The workings also include two shafts 15 m and 61 m deep. The deposit was worked by various concerns including South Bay Mining Company and Great Lakes Mines Limited. Most of the mining was done between 1910 and 1913; about 46 655 g of silver were produced. In 1951, Cobalt Badger Silver Mines Limited sank a new shaft 180 m northwest of the original shaft.

The mine is near the west shore of Great South Bay (Milner Lake), about 19 km southwest of Gowganda. See Map 8, No. 15, on page 77.

Road log from Highway 560 at **km 116.2** (see road log for highways 65 and 560 on page 68):

km	0	Junction, Highway 560 and Milner Lake Road; proceed south along Milner Lake Road toward the Bartlett mine.
	7.8	Junction. The road on left leads to the Reeve-Dobie mine; proceed along the road on right.
	9.1	Bartlett mine. Continue along the road leading east.
	10.3	South Bay mine.

Refs.: 25 p. 55; 122a p. 74; 170 p. 398.

Maps (T): 41 P/10 Gowganda
(G): 2348 Van Hise and Milner townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Tyranite mine

NATIVE GOLD, PYRITE, MAGNETITE, CHALCOPYRITE, CHLORITE

In veins occupying fractures at contact of granodiorite and greenstone

The Tyranite mine is a former gold producer. During mining operations, some coarse native gold was obtained from quartz-carbonate veins containing pyrite crystals and grains. The pyrite contained gold. Magnetite, chalcopyrite, and chlorite were associated with the pyrite.

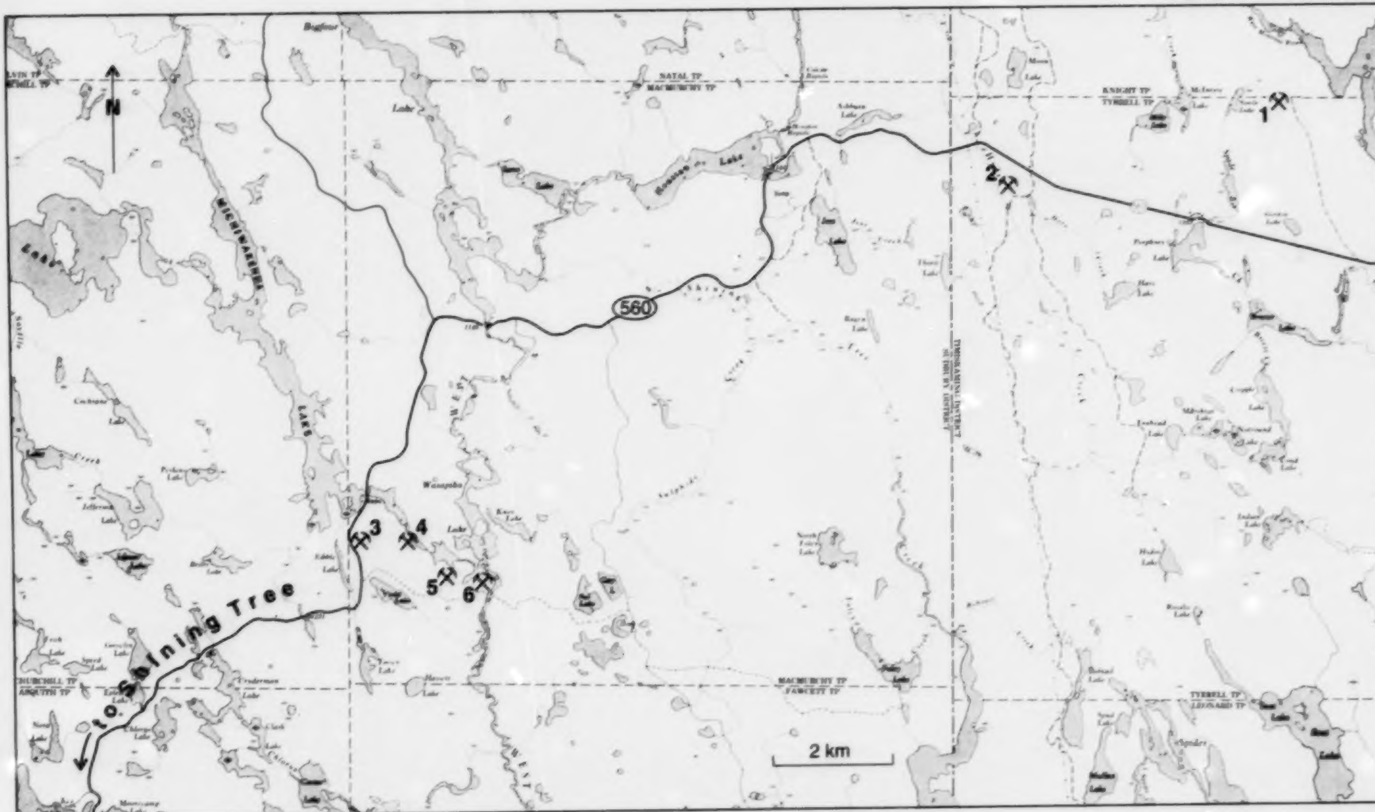
Gold-bearing veins were discovered by L.O. Hedlund late in 1930 when prospectors directed their attention to the district following the discovery of rich gold-bearing veins at the Ashley deposit near Matachewan. The district had been prospected for silver following the prospecting rush in the Gowganda area, but gold prospects were overlooked in spite of discoveries in 1911 of auriferous veins in the Shiningtree area to the west. By 1931, most of the favourable ground east of Shiningtree had been staked for gold. Surface exploration of the Hedlund property was conducted by various concerns in 1931. Tyranite Mines Limited was formed in 1935 to develop the orebody. A three-compartment shaft was put down and a mill erected on the site. The underground workings reached a depth of 350 m. Production from 1939 to 1942, when the mine was closed due to wartime labour shortage, amounted to 975 141 g of gold and 151 160.6 g of silver.

Access to the mine is via a rough single-lane road, 2.8 km long, leading west from Highway 560 at **km 129.7** (see road log for highways 65 and 560 on page 68). This turnoff is 29 km northeast of Shining Tree. See Map 9, No. 1, on page 88.

Refs.: 29 p. 55-56; 66 p. 25-26, 49-52; 220 p. 641; 227 p. 258; 231 p. 206; 232 p. 183

Maps (T): 41 P/11 Shining Tree
(G): 41b Tyrrell-Knight area, districts of Timiskaming and Sudbury (Ontario Geological Survey, 1:47 520)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Part of 41 P/10 & 41 P/11



Map 9. Shining Tree area

1. Tyranite mine 2. Matona mine 3. Ronda mine
4. West Tree mine 5. Saville-McVittie mine 6. McIntyre-MacDonald occurrence

Maps (G): 2365 Macmurchy and Tyrrell townships, Sudbury and Timiskaming districts (Ontario Geological Survey, 1:31 680)

Matona mine

NATIVE GOLD, PYRITE

In sheared volcanic rocks

Native gold is associated with finely disseminated pyrite in quartz-carbonate veins in sheared rock.

The deposit was explored in the 1930s by Matona Gold Mines Limited. A shaft was sunk to a depth of 70.5 m with opening levels at 38 m and 65.5 m. Development ceased in 1937 and there was no production.

The mine is on the east side of Hydro Creek and south of Highway 560. Access is by a trail, 395 m long, leading south from Highway 560 at **km 135.2** (see road log for highways 65 and 560 on page 68). This turnoff is 23.5 km northeast of Shining Tree. See Map 9, No. 2, on page 88.

Refs.: 177 p. 178-179; 226 p. 104; 228 p. 176.

Maps (T): 41 P/11 Shining Tree

(G): 41b Tyrrell-Knight area, districts of Timiskaming and Sudbury (Ontario Geological Survey, 1:47 520)

2365 Macmurchy and Tyrrell townships, Sudbury and Timiskaming districts (Ontario Geological Survey, 1:31 680)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Ronda (Wasapika-Ribble) mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, EPIDOTE

In veins cutting schistose pillow lava

Native gold was associated with small amounts of pyrite, chalcopyrite, and sphalerite in quartz at this former gold mine. The gold was a pale colour due to its high silver content and was localized in fractures in quartz. Tiny prismatic aggregates of epidote were noted in quartz specimens found in the mine dumps.

Gold was discovered in the West Shining Tree Lake area in 1911 and at the Ronda deposit in 1912. The following year, about 300 prospectors camped at Wasapika Lake, numerous claims were staked, and many of the veins underwent development; camps were built and mining equipment installed, but the rich pockets of high grade ore were few and irregularly distributed and very little gold was produced. The most promising of the discoveries was known as the Ribble vein and became the Ronda mine. It was discovered by two prospectors who were grubstaked by A. Ribble. Development was undertaken by Wasapika Consolidated Mines Limited in 1916 and continued until 1923. Neville Canadian Gold Mines Limited renewed activity in 1934, followed by Bramor Mining (Ontario) Limited in 1935. Ronda Gold Mines Limited conducted operations from 1936 to 1939 when the mine was closed. The underground workings were reached by two shafts sunk to depths of 99 m and 213 m respectively. A mill operated on the site and production amounted to 84 822 577 g of gold and 150 227.5 g of silver.

The mine is located on Highway 560 at **km 151.7**, about 8 km northeast of Shining Tree (see road log for highways 65 and 560 on page 68.) See Map 9, No. 3, on page 88.

Refs.: 29 p. 53-55; 54 p. 83-84, 92-94; 85 p. 30, 45-46; 99 p. 150; 176 p. 143-144; 205 p. 193-194; 220 p. 641; 222 p. 593; 229 p. 234; 231 p. 239.

Maps (T): 41 P/11 Shining Tree

(G): 29a West Shiningtree gold area, district of Sudbury (Ontario Geological Survey, 1:31 680)

2365 Macmurchy and Tyrrell townships, Sudbury and Timiskaming districts (Ontario Geological Survey, 1:31 680)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

West Tree (Caswell) mine

NATIVE GOLD, PYRITE, MOLUBDENITE, CHALCOPYRITE, TOURMALINE

In quartz veins in carbonate schist

Spectacular specimens of native gold were obtained from narrow quartz veins during initial exploration of this deposit. Pyrite (as small crystals), molybdenite, chalcopyrite and tourmaline were associated with the gold. The deposit was staked in 1911 and exploratory work was done at intervals after that. Operators included Caswell Mining Company Limited in 1916 and West Tree Mines Limited in 1919. Three shafts were sunk: No. 1 (160 m) is on the west shore of the

Plate 18

Ronda mine, 1972. (GSC 161457)

narrows between Michiwakenda Lake and Wasapika Lake, and two shallower shafts are on the opposite (east) shore. The rich gold specimens came from an opencut and shaft on the east shore.

The mine is on the shore of the narrows between Wasapika and Michiwakenda lakes, about 9 km northeast of Shining Tree. See Map 9, No. 4, on page 88.

Road log from Highway 560 at **km 152.4** (see road log for highways 65 and 560 on page 68):

km	0	Junction of Highway 560 and a trail leading east; proceed onto this trail.
	0.75	Junction; follow trail on left.
	1.35	End of trail at No. 1 shaft. The other workings are across the narrows from this point.

Refs.: 29 p. 44-45; 65a p. 75; 85 p. 46-47.

Maps (T): 41 P/11 Shining Tree
(G): 29a West Shiningtree gold area, district of Sudbury (Ontario Geological Survey, 1:31 680)
P765 Macmurchy Township, district of Sudbury (Ontario Geological Survey, 1:15 840)

Plate 19

Paulson Bay, north end of Lake Timiskaming. Present day farm land (foreground) formed the bed of glacial Lake Ojibway-Barlow about 10 000 years ago. When the glaciers retreated, the lake disappeared, leaving behind stratified clay deposits that form the Great Clay Belt of northern Ontario and Quebec. (GSC 161454)

(G): 2365 Macmurchy and Tyrrell townships, Sudbury and Timiskaming districts (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Saville-McVittie mine

NATIVE GOLD, NATIVE SILVER, SMALTITE, PYRITE, ERYTHRITE, TOURMALINE

In quartz veins in sheared volcanic rock

The property was originally staked in 1911 as the Jefferson and Saville-McVittie claims. The deposit consists of two gold-bearing quartz veins known as the Evelyn and Saville veins. During original exploration, rich gold specimens were found in pockets at the contact of quartz and slaty bands in the Evelyn vein; the vein also carried native silver, smaltite, pyrite, and erythrite. The Saville vein, on which most of the work was done, consisted of white and pink quartz carrying gold, pyrite, and tourmaline. Work on the property was carried out between 1911 and 1938 by Atlas Gold Mines Limited and White Rock Mining Company Limited. The Evelyn vein was developed by an adit and a shaft 27 m deep. Two shafts were sunk on the Saville vein to depths of 12 m and 130 m respectively. Total production of gold and silver was valued at $1607 and was obtained in 1922 and 1933.

The mine is southeast of the West Tree mine and about 9 km northeast of Shining Tree. See Map 9, No. 5, on page 88.

Road log from Highway 560 at **km 152.4** (see road log for highways 65 and 560 on page 68):

km	0	Junction of Highway 560 and a trail leading east; proceed onto this trail.
	0.75	Junction; continue straight ahead. (The trail on left leads to the West Tree mine.)
	1.35	Junction. The trail on left leads 700 m to the Saville shaft; the Evelyn shaft is about 300 m southeast of the Saville shaft. From this junction, the trail continues eastward to Pat Lake and to the old *McIntyre-MacDonald occurrence*, which was investigated around 1912 using two shafts, each about 15 m deep. At a point 850 m east of the junction, a trail leads northeast 150 m to the first shaft; the second shaft is 100 m north of this shaft. Visible gold occurred in quartz veins in volcanic rocks. See Map 9, No. 6, on page 88.

Refs.: 29 p. 37-38, 54; 65a p. 74-75; 85 p. 40, 44-45.

Maps (T): 41 P/11 Shining Tree
(G): 29a West Shiningtree gold area, district of Sudbury (Ontario Geological Survey, 1:31 680)
P765 Macmurchy Township, district of Sudbury (Ontario Geological Survey, 1:15 840)
2365 Macmurchy and Tyrrell townships, Sudbury and Timiskaming districts (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Dawson Point occurrence

FOSSILS

In sandstone, dolomitic limestone

Silurian fossils including corals, bryozoans, brachiopods, and trilobites occur in outcrops along the shore of Lake Timiskaming at Dawson (Wabi) Point. The rocks are exposed at the end of the road and along the escarpment on the east side of the point. The peninsula that terminates at Dawson Point is underlain by limestone and shale capped by resistant dolomitic limestone, all of Silurian age. The rock forms precipitous cliffs along the eastern shore of the peninsula. See Map 10, No. 1, on page 94.

Road log from the junction of highways 11B and 65E at New Liskeard:

km	0	Junction, highways 11B and 65E; proceed east onto Highway 65E.
	1.6	Junction; turn right onto a gravel road.
	2.4	Junction at a cemetery; turn left.
	8.7	End of the road at Dawson Point.

Ref.: 87 p. 4, 34-36, 38-39.

Maps (T): 31 M/12 New Liskeard
(G): 2066 Casey and Harris townships, Timiskaming district (Ontario Geological Survey, 1:31 680)

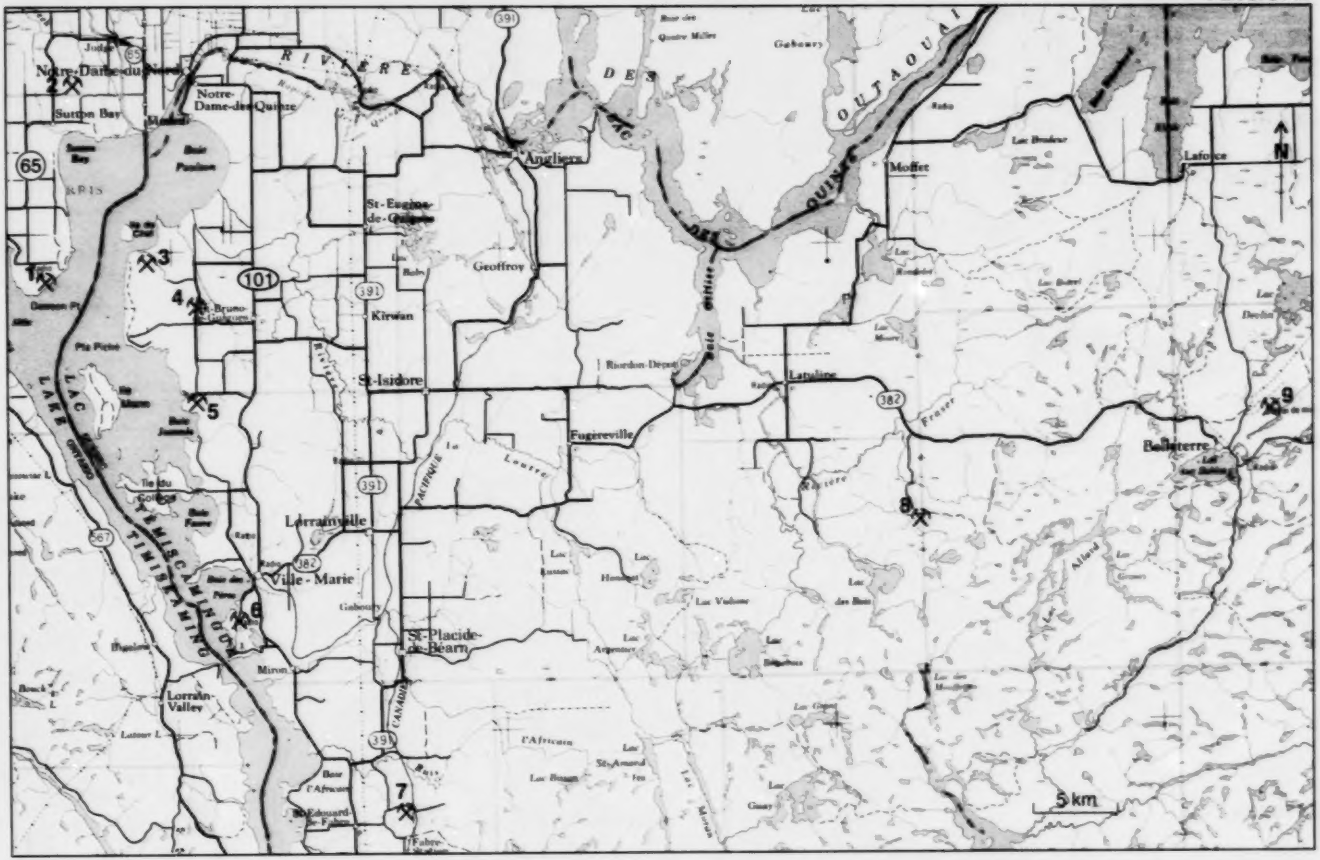
Langis (Casey) mine

Minerals comprising the orebody at this former silver-cobalt producer are essentially the same as those occurring in the Cobalt mines (see page 17). A new mineral, langisite, was first described from this deposit; it was found in association with safflorite, maucherite, parkerite, cobalt pentlandite, and with bismuth and cobalt sulphides. Nickeline, arsenopyrite, pyrite, erythrite, and annabergite, as well as specimens of Cobalt conglomerate, are common in the dumps.

The deposit was discovered in 1906 by David Bucknell who happened to notice cobalt bloom (erythrite) on an outcrop. Development of the deposit was undertaken the same year by Casey Cobalt Silver Mining Company Limited and production began in 1908. Operations were interrupted in 1917 due to a fire in the plant and finally ceased in 1919. Small-scale operations were carried out by various individuals in the 1940s.

Langis Silver and Cobalt Mining Company Limited resumed mining in 1956, and operations continued until the summer of 1968. Total production during this period amounted to 221 897 510 g of silver, 165 365 kg of cobalt, 64 205 kg of nickel, and 40 062 kg of copper. Agnico-Eagle Mines Limited worked the deposit from 1983 to 1989. The mine was serviced by a number of shafts, the deepest being 369.7 m.

Part of 31 M



Map 10. New Liskeard - Belleterre area

1. Dawson Point occurrence 2. Langis mine 3. Guigues limestone quarry 4. Guigues sandstone quarry 5. Wright mine 6. Ville-Marie granite quarry 7. Terra Nova, Pontiac mines 8. Lorraine mine 9. Belleterre mine

The mine is on the west side of Casey Mountain, which rises about 76 m above the surrounding lowland and is composed of Huronian rocks (conglomerate, arkose, greywacke) topped by erosional remnants of a diabase sill that intruded the existing rocks in Proterozoic time. See Map 10, No. 2, on page 94.

Road log from the junction of highways 11B and 65E at New Liskeard:

km	0	Junction, highways 65E and 11B; proceed east onto Highway 65E.
	1.6	Turnoff to Dawson Point; continue along the highway.
	4.7	Dolomitic limestone containing Silurian coral fossils is exposed in *roadcuts* at bend.
	6.1	Buff dolomitic limestone containing cavities lined with tiny crystals of colourless to white calcite is exposed in *roadcuts*.
	9.2	Dolomitic limestone with abundant shell fossils is exposed in *roadcuts* at the bend in the highway. The rock is of Silurian age.
	10.8	Junction, gravel road leading up the escarpment that extends south to Dawson Point. The escarpment rises abruptly from the clay-covered plain crossed by Highway 65E from New Liskeard. The varved (or bedded) clay was deposited by glacial Lake Ojibway-Barlow, which existed at the close of Pleistocene time and flooded the area from present Lake Timiskaming northward to Lake Abitibi. The clay is believed to have been deposited over about 3600 years; it provides rich, fertile soil for farmland in the district. The road log continues along Highway 65E to the Ontario/Quebec border.
	12.4	Junction, road on right to Langis mine; the mine is 0.65 km from this junction. The road log continues along Highway 65E, which parallels the west side of Casey Mountain.
	14.5	Ordovician limestone (south end of the cuts) and red hornblende syenite (north end of the cuts) are exposed in *roadcuts* on both sides of the highway. The hornblende syenite intruded older Precambrian rocks in Archean time and is exposed conspicuously on the west side of Casey Mountain to km 15.4. The limestone contains cavities lined with colourless to white calcite crystals that fluoresce bright pink under ultraviolet rays (short rays are more effective than long). Barite as colourless, pink, or white tiny platy aggregates, some forming hemispheres, is associated with the calcite. Barite also occurs as orange veins in limestone bordering the calcite; marcasite is found with it.
	22.0	Ontario/Quebec border.

Refs.: 87 p. 4-6, 46, 145; 142 p. 153; 145 p. 101; 161 p. 111, 112; 170 p. 320-321; 195 p. 2-3, 16, 23, 65-69; 251 p. 186.

Maps (T): 31 M/12 New Liskeard
(G): 2066 Casey and Harris townships, Timiskaming district (Ontario Geological Survey, 1:31 680)

Rémigny armenite occurrence

ARMENITE, ALBITE, ZOISITE, PIEMONTITE, NATROLITE, KAOLINITE, HEMATITE, PREHNITE

In veins in altered diorite

The minerals occur in irregular, interconnecting veins up to 1.5 cm wide. Armenite occurs as colourless to white prismatic crystals forming sheaf-like aggregates; individual crystals up to 5 cm long have been reported. It occurs with colourless and white crystals of albite, the most common mineral in the veins. Pink zoisite (thulite), a conspicuous constituent of the veins, occurs as radiating and sheaf-like aggregates of prismatic crystals less than 1 cm long. Some of the zoisite contains dark red to purplish grains of piemontite. Kaolinite occurs as a light brownish powder on armenite and zoisite. Other minerals reported include natrolite as white rosettes, colourless calcite crystals, small quartz crystals, and small specks of specular hematite. White massive prehnite occurs in the host rock.

Armenite-zoisite mineralization is exposed in a roadcut near Rémigny, which is 37 km from Notre-Dame-du-Nord via highways 101 and 391. To reach the occurrence, proceed along the road leading east from Rémigny; the roadcut is on the south side of the road at a point 3.9 km from the bridge at Rémigny.

Ref.: 147b p. 453-464.

Maps (T): 31 M/11 Angliers
(G): 1643 Quinze Lake-Barrière Lake area, Témiskamingue County (MRNQ, 1:63 360)
P1421 Rémigny-Villars area, counties of Rouyn-Noranda and Témiscamingue (MRNQ, 1:63 360)

Guigues limestone quarry

DOLOMITE, CALCITE, FOSSILS

In dolomitic limestone

Microscopic crystals of white dolomite and colourless calcite line cavities in buff dolomitic limestone. Grains of white and grey quartz occur in the limestone. Fossils, including gastropods of Ordovician age, are found in the limestone.

The quarry is operated by Dolo-Mine Inc. The limestone is used for agricultural lime, as an acid neutralizer, and as an absorbent agent. The quarry is near the eastern shore of Lake Timiskaming west of Saint-Eugène-de-Guigues. See Map 10, No. 3, on page 94.

Road log from Saint-Eugène-de-Guigues:

km	0	Junction, Highway 101 and a road leading west (this junction is 17.5 km south of the junction of highways 101 and 65 in Notre-Dame-du-Nord, and 15.0 km north of the junction of highways 101 and 382 in Ville-Marie); proceed along the road leading west.
	3.4	Junction; turn right (north).

km	4.7	Guigues sandstone quarry on left. Continue straight ahead (north).
	6.0	Junction; turn left (west).
	10.3	Guigues limestone quarry.

Refs.: 11a p. 5; 46a p. 123-124; 87 p.43-46; 147a p. 271.

Maps (T): 31 M/5 Cobalt
(G): 1007 Townships adjoining Lake Timiskaming, County of Pontiac, Quebec (Geological Survey of Canada, 1:126 720)
703A Southern Quebec, west sheet (ministère des Ressources naturelles, Québec, 1:760 320)

Guigues sandstone quarry

CALCITE CRYSTALS

In sandstone

Small scalenohedra and rhombs of colourless to white calcite occur in cavities and in veins in buff, iron-stained sandstone. The calcite fluoresces pink under short ultraviolet rays. The sandstone is composed of quartz grains and nodules up to 5 mm across, and is sufficiently friable to be converted to sand during blasting operations.

The sand is used in sandblasting, as a swimming pool filtration agent, and as traction sand for railways. The quarry, operated by Témisca Silice, is about 3.5 km west of Saint-Eugène-de-Guigues. Follow the road log for the Guigues limestone quarry (page 96). See Map 10, No. 4, on page 94.

Refs.: 11a p. 5, 19; 46a p. 123-124; 74 p. 26-27, 35; 147a p. 271.

Maps (T): 31 M/6 Ville-Marie
(G): 387A Ville-Marie sheet (west half), Témiscamingue County, Quebec (Geological Survey of Canada, 1:63 360)

Wright mine

GALENA, SPHALERITE, CHALCOPYRITE, PYRITE, ANGLESITE, LEADHILLITE

In brecciated zone in Cobalt conglomerate

Argentiferous galena occurs with sphalerite, chalcopyrite, and pyrite in a matrix of white and pink calcite, pink dolomite, quartz, and chlorite. The calcite fluoresces pink to orange red in ultraviolet light. Colourless, transparent microscopic crystals of quartz occur in cavities in the calcite-quartz mass. A mixture of anglesite and leadhillite occurs as a dull earthy white coating on galena.

Sieur de Troyes first reported lead ore at this locality on the eastern shore of Lake Timiskaming in 1686 when he led a detachment of 100 French explorers on a military expedition to James Bay. The deposit, however, was known to Indians of the district and possibly to the officers of the Compagnie du Nord trading company, which had established a trading post 29 km from the mine in 1668. At Mattawa, de Troyes engaged an Indian by the name of Coignac to guide him to the deposit, which he did on May 24, 1686; de Troyes recorded the event in his diary: "On the twenty-second, it rained part of the day but this did not prevent me from leaving after Mass accompanied by three canoes to visit a mine located six leagues from the house; I had

ordered Sieur de ste helenne [sic], whom I had left behind so that he could finish taking care of business, to meet me the following day with the rest of the detachment and to remain in the northern trail of the lake to facilitate this meeting. Two leagues from the house I saw three indian [sic] cabins. I traded with the Indians and obtained a canoe with a capacity of four which I used for the rest of the trip and for my return to Québec. I camped there on an island because time did not permit me to go any further."

"On the twenty-third, after Mass, we walked to find this mine, guided by a man named Coignac. During our search we came upon an indian [sic] cabin whose inhabitants had killed a large moose the evening before; this gave the opportunity to camp nearby so that Coignac might find the mine more easily. He searched without success for the rest of the day. During that time two lieutenants left the house to rejoin us with all our people. However, bad weather separated them; one took to the south, one to the north, others to the islands, the final result being that very few people joined me."

"On the twenty-fourth, there lasted for the entire day a fairly strong wind accompanied by rain, but Coignac was now certain of the mine's location and he assured me that it was very near. I paddled while he steered the canoe, and we left, despite the weather, convinced that we could find the mine. Indeed, we did find it. The mine is located to the east and west, on the western shore of the lake; there is a rock shaped like a half-circle measuring fifty feet on the shore; it is ten feet above the water level and has a depth of 100 feet, and since there is no soil on it, it loses itself under a mountain of rocks. With great difficulty, we took some small pieces and returned to camp." (Ref.: 27 p. 45-46.)

Plate 20

Wright mine, 1875. (Courtesy of Ontario Archives Acc. 3075-S1890)

Two months later, Le Chevalier de Tonty was despatched by M. de Denonville to investigate the occurrence; he collected specimens of a yellow metallic mineral and reported the deposit to contain lead or tin minerals, but it was deemed by M. M. Raudot to be too distant from Montreal for profitable exploitation at that time (1708).

The deposit was rediscovered in about 1850 by Edward V. Wright of Ottawa who held the timber rights in the area. In the course of removing timber, he noticed that his boot had dislodged some chips of galena ore, which he took back to Ottawa. These specimens lay on his desk for some twenty years. In 1878, he had them assayed by the Geological Survey of Canada. The silver content was found to be in the order of 18 ounces to the ton (617.13 g/t). Encouraged by the results, he teamed up with J.M. Currier and E.C. Eustis and sank a shaft to 3.7 m and removed about 9 t of ore. This shipment sank to the bottom of the Ottawa River when the barge carrying it smashed in the rapids at Deux Rivières. While investigating this deposit, Mr. Wright was accompanied and assisted by his two young sons, M.P. Wright and N.C. Wright, who later went on to make the first discoveries of silver ore in the Kerr Lake area, at the Drummond and Kerr Lake mines respectively.

George Goodwin of Ottawa and G.T. Brophy resumed operations at the Wright mine in 1885; they deepened the shaft to 19 m and installed a stamp mill. The mill later burnt down and no ore shipments were made. In 1890-1891, Mattawa Mining and Smelting Company of New York deepened the shaft to about 30 m and installed a plant consisting of a 50-ton mill and a smelting furnace; about 135 t of concentrates were produced. A few years later, Robert Chapin of Ingersoll Rock Drill Company, New York deepened the shaft to 76 m, built a new mill, installed the district's first compressor, and shipped some concentrates. In 1895, Petroleum Oil Trust of London continued development to the 78 m level and shipped lead concentrates to Swansea, Wales. Between 1900 and 1903, British and Canadian Lead Company Limited deepened the shaft to 107 m and shipped 478 t of concentrates. The mine was subsequently dewatered and investigated by several companies and individuals, but no further production has been recorded. In 1987, the property was acquired by International Thunderwood Explorations Limited.

The mine, on the shore of a small bay known to early explorers as anse à la Mine, is southwest of Saint-Eugène-de-Guigues and north of Ville-Marie; it is immediately north of Trépanier (Joannès) Bay on the east side of Lake Timiscaming. The old shaft is about 6 m from the shore. See Map 10, No. 5, on page 94.

Road log from Highway 101 between Notre-Dame-du-Nord and Ville-Marie:

km	0	Junction of Highway 101 and the road leading west to Trépanier (Joannès) Bay (this junction is 21.8 km south of the junction of highways 101 and 65 in Notre-Dame-du-Nord, and 10.7 km north of the junction of highways 101 and 382 in Ville-Marie); proceed west toward Trépanier (Joannès) Bay.
	3.2	Intersection of a north-south road and Trépanier (Joannès) Bay and Chemin du Roi roads leading to the shore; follow the shore road on left leading southwest to Trépannier (Joannès) Bay.
	4.0	Junction, at the shore; turn left (south).
	4.2	Wright mine on right, between the road and the shore.

Refs.: 5 p. 147-149; 27 p. 43-46; 32 p.23-24; 36 p. 20-27; 57 p. 28-30; 68a p. 51-52; 124 p. 665-667; 127 p. 130-132; 206 p.46; 213 p. 38-39; 250 p.13

Maps (T): 31 M/6 Ville-Marie
(G): 387A Ville-Marie sheet (west half), Témiscamingue County, Quebec (Geological Survey of Canada, 1:63 360)

Ville-Marie granite quarry

GRANITE

Pink to red granite occurs in an area extending from Témiskaming to Rollet, and including the Ville-Marie area. The granite is medium- to coarse-textured, rose to dark red, and contains microcline, quartz, biotite, and minor hornblende. The rock is used as monument stone.

The quarry is operated by Carrière Granitem Inc.; it is located at pointe au Cèdre, 3 km southwest of Ville-Marie. See Map 10, No. 6, on page 94.

Refs.: 28 p. 75; 134 p. 9-11.
Maps (T): 31 M/6 Ville-Marie
(G): 387A Ville-Marie sheet (west half), Témiscamingue County, Quebec (Geological Survey of Canada, 1:63 360)

Terra Nova mine

CHALCOPYRITE, PYRITE, HEMATITE, MAGNETITE, MARCASITE, EPIDOTE, ACTINOLITE, CHLORITE, AXINITE

In volcanic rocks

Metallic minerals chalcopyrite, pyrite, hematite, magnetite, and marcasite occur as disseminated grains and lenses in altered volcanic rocks and in calcite-feldspar veins. Massive epidote is associated with white and orange massive calcite and pink to orange-red feldspar. Microscopic crystals of epidote, actinolite, chlorite, pyrite, and magnetite are associated with massive epidote. Purplish-grey axinite occurs as prismatic aggregates and in massive form.

Terra Nova Mines Limited explored the deposit between 1907 and 1909 using shafts and several pits, by during a search for silver-bearing veins following the Cobalt silver rush.

The mine is about 3 km northeast of Fabre. See Map 10, No. 7, on page 94.

Road log from Fabre:

km	0	Junction of Highway 101 and Station Road; proceed east along Station Road (this junction is 17.5 km south of the junction of highways 101 and 382 in Ville-Marie).
	1.6	Junction; turn left (north).
	3.2	Trail on right leading 50 m south to the Terra Nova shaft and dumps.

Refs.: 46b p. 318-319; 88a p. 69-70; 167a p. 28-30; 213a p. 154; 234a p. 41a-42.

Maps (T): 31 M/3 Fabre
(G): 1458 Fabre-Mazenod area, County of Témiscamingue (ministère de l'Énergie et des Ressources, Québec, 1:63 360)

Pontiac mine

PYRITE, HEMATITE, MAGNETITE, CHALCOPYRITE, GALENA

In volcanic rocks

The deposit was originally explored to investigate a surface gossan consisting of hematite, pyrite, and chalcopyrite. A shaft was sunk to 15.2 m to calcite-feldspar veins containing argentiferous galena, pyrite, and chalcopyrite.

The deposit was worked in 1907 by Pontiac Mining and Milling Company. It is about 3.5 km northeast of Fabre and adjacent to the Terra Nova mine. See Map 10, No. 7, on page 94.

Road log from Fabre:

km	0	Junction Highway 101 and Station Road; proceed east along Station Road (this junction is 17.5 km south of the junction of highways 101 and 382 in Ville-Marie).
	1.6	Junction; turn left (north).
	3.2	Trail on right leading to Terra Nova mine; continue straight ahead.
	3.5	Trail on right leading 90 m to Pontiac mine.

Refs.: 46b p. 318-319; 88a p. 69-70; 167a p. 28-30; 213a p. 154; 234a p. 41a-42.

Maps (T): 31 M/3 Fabre
(G): 1458 Fabre-Mazenod area, County of Témiscamingue (ministère des Ressources naturelles, Québec, 1:63 360)

Laverlochère granite occurrence

HORNBLENDE GRANITE

Greenish granite outcrops along hills and ridges east of Laverlochère; it was formerly quarried for use as a monument stone. Its green colour is due to alteration of feldspar. The granite is composed of uniformly distributed greenish feldspar, rose feldspar, colourless quartz, and dark-green hornblende; it is referred to as 'four-colour' granite, and takes a high polish.

Pink granite is exposed in *roadcuts* along Highway 382 from Fugèreville to Latulipe and beyond. Epidote occurs as crystalline aggregates forming crusts along surfaces of the granite.

Refs.: 28 p. 75; 134 p. 11-12.

Maps (T): 31 M/6 Ville-Marie
(G): 387A Ville-Marie sheet (west half), Témiscamingue County, Quebec (Geological Survey of Canada, 1:63 360)
388A Ville-Marie sheet (east half), Témiscamingue County, Quebec (Geological Survey of Canada, 1:63 360)

Lorraine mine

CHALCOPYRITE, PYRRHOTITE, PENTLANDITE, PYRITE, SPHALERITE, GALENA, ROZENITE, GOETHITE, GYPSUM, POSNJAKITE, BROCHANTITE

At the contact of gabbro and andesite

The ore at this former copper-nickel producer consisted of chalcopyrite, pyrrhotite, and pentlandite with minor amounts of pyrite, sphalerite, and galena. Black amphibole, calcite, quartz, and chlorite were associated with the metallic minerals, which occurred in massive form and as disseminations. Secondary minerals that have formed coatings or encrustations on specimens in the rock dumps include earthy white rozenite, rusty-brown goethite, white transparent gypsum (as 'micro' rosettes), greenish-blue powdery posnjakite, and bright green brochantite. Dark grey porphyry with white feldspar phenocrysts was found in the dumps.

The deposit, discovered in 1961 by O'Brien Rivard, was originally explored by Mespi Mines Limited. Lorraine Mining Company Limited commenced development in 1963. A mill was constructed on the site and a shaft was put down to 332 m. Production from 1965 to 1968 amounted to about 6 342 000 kg of copper and nearly 2 718 000 kg of nickel. The concentrates were treated at the Noranda smelter.

Plate 21

Lorraine mine, 1972. (GSC 161455)

The mine is located west of Belleterre. Access is by a 5 km road, leading south from Highway 382 at a point 10 km east of the highway bridge at Latulipe. The turnoff is 20 km west of Belleterre. A water-filled pit, some rock dumps, and a building are found on the site. See Map 10, No. 8, on page 94.

Refs.: 101 p. 10-12; 241 p. 251; 245 p. 217; 246 p. 229.

Maps (T): 31 M/7 Belleterre
(G): 1615 East half of Gaboury township, Témiscamingue County (ministère des Ressources naturelles, Québec, 1:12 000)
389A Guillet Lake sheet (west half), Témiscamingue County, Quebec (Geological Survey of Canada, 1:63 360)

Belleterre mine

NATIVE GOLD, PYRITE, PYRRHOTITE, SPHALERITE, GALENA, CHALCOPYRITE

In quartz veins cutting volcanic rocks

Native gold occurred in white, greyish, and bluish quartz at this former gold mine. Pyrite, pyrrhotite, sphalerite, galena, and chalcopyrite were present in quartz and in host rocks. The rock dumps furnish specimens of sulphides and of a dark grey, fine grained porphyry.

Promising gold-bearing veins, including this deposit, were discovered in the Belleterre area in 1933. Most of the development work was done on the Belleterre mine; McIntyre Porcupine Mines Limited sank an exploration shaft in 1935. The mine became a producer in 1936, operated by Belleterre Mines Limited (later Belleterre Quebec Mines Limited). Production continued until 1959 except for an interruption of a few months in 1937-1938. Gold valued at almost $27 million was produced. The mine was serviced by several shafts, the deepest reaching 686 m.

The foundations of dismantled mine buildings mark the mine site. A few rock dumps are found near the shafts. See Map 10, No. 9, on page 94.

Road log from Belleterre village:

km	0	Proceed east along Highway 382 from the intersection of the street leading to the church.
	0.3	Junction; turn left.
	2.9	Junction, turn right.
	3.4	Shaft No. 2 on right. The road continues to other workings.

Refs.: 2 p. 32-43, 55; 74 p. 1, 28-30; 236 p. 28; 237 p. 24.

Maps (T): 31 M/7 Belleterre
(G): 807 Belleterre area, Témiscamingue County (ministère des Ressources naturelles, Québec, 1:12 000)
390A Guillet Lake sheet (east half), Témiscamingue County, Quebec (Geological Survey of Canada, 1:63 360)

MATACHEWAN AREA

The Matachewan district was prospected as early as 1909, but since prospectors did not find the diabase rock favourable to the occurrence of silver ores, they turned their attention elsewhere, and the gold deposits were overlooked. Within a few years after the 1909 discovery of gold in the Porcupine district to the north, numerous claims were staked near Matachewan and in areas to the west. The earliest development work was done by Mr. H. Minard on claims near the forks in the Montreal River (just south of Matachewan village), but results were not encouraging and work was discontinued.

Important gold discoveries were made in 1916 by Jake Davidson and in 1917 by Sam Otisse on claims that later became the Young-Davidson mine and the Matachewan Consolidated mine respectively. These promising discoveries attracted a rush of prospectors and numerous claims were staked. The properties did not become important producers until the 1930s when the price of gold increased. Between 1934 and 1957, nearly 31 000 000 g of gold and 5 132 000 g of silver were obtained from the area's two gold producers: the Young-Davidson mine and the Matachewan Consolidated mine.

Active mining in the area ceased in 1964 with the closing of the Ryan Lake mine, a former copper-gold-silver producer. Other deposits in the Matachewan area have been exploited in the past for asbestos, barite, and iron. The attractive rock referred to as Matachewan or Bannockburn porphyry occurs in the area.

Refs.: 22 p. 215; 35 p. 1; 114 p. 1-2, 23-24.

Maps (T): 41 P Gogama
42 A Timmins
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Mines along highways 66 and 566

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along highways 66 and 566:

km	0	Kenogami Lake, at the junction of highways 66 and 11; proceed onto Highway 66 (west).
km	7.7	Pink Archean granite is exposed in *roadcut* on right.
km	11.4	Matachewan diabase porphyry and pink hornblende-biotite granite are exposed in roadcuts. The granite contains irregular patches of epidote (commonly 1 cm across) and grains of titanite. The epidote-bearing granite makes an attractive ornamental stone. The porphyry is composed of a charcoal-grey matrix enclosing rectangular and rounded blotches (up to 2 cm in diameter) of light olive-green feldspar that has altered almost completely to mica. The rock takes a good polish and can be used for ornamental purposes.
km	13.0	Granitic gneiss is exposed in roadcuts.

MATACHEWAN AREA

The Matachewan district was prospected as early as 1909, but since prospectors did not find the diabase rock favourable to the occurrence of silver ores, they turned their attention elsewhere, and the gold deposits were overlooked. Within a few years after the 1909 discovery of gold in the Porcupine district to the north, numerous claims were staked near Matachewan and in areas to the west. The earliest development work was done by Mr. H. Minard on claims near the forks in the Montreal River (just south of Matachewan village), but results were not encouraging and work was discontinued.

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Active mining in the area ceased in 1964 with the closing of the Ryan Lake mine, a former copper-gold-silver producer. Other deposits in the Matachewan area have been exploited in the past for asbestos, barite, and iron. The attractive rock referred to as Matachewan or Bannockburn porphyry occurs in the area.

Refs.: 22 p. 215; 35 p. 1; 114 p. 1-2, 23-24.

Maps (T): 41 P Gogama
42 A Timmins
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Mines along highways 66 and 566

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log to mines along highways 66 and 566:

km	**0**	**Kenogami Lake, at the junction of highways 66 and 11; proceed onto Highway 66 (west).**
km	**7.7**	**Pink Archean granite is exposed in *roadcut* on right.**
km	**11.4**	**Matachewan diabase porphyry and pink hornblende-biotite granite are exposed in *roadcuts*. The granite contains irregular patches of epidote (commonly 1 cm across) and grains of titanite. The epidote-bearing granite makes an attractive ornamental stone. The porphyry is composed of a charcoal-grey matrix enclosing rectangular and rounded blotches (up to 2 cm in diameter) of light olive-green feldspar that has altered almost completely to mica. The rock takes a good polish and can be used for ornamental purposes.**
km	**12.0**	**Granitic gneiss is exposed in *roadcuts*.**

km	**15.0**	Hornblende granite is exposed in *roadcuts*.
km	**19.3**	Bridge over Englehart River.
km	**32.1**	*Syenite* cut by a quartz vein is exposed on the right (north) side of the highway.
km	**32.2**	*Prospect pit.* Trail on right leading to a pit in a wooded area on the north side of the highway. A quartz vein containing pyrite and black tourmaline is seen in the pit. The vein cuts red syenite. The occurrence was investigated for gold several years ago.
km	**34.1**	Red syenite is exposed in *roadcuts*.
km	**35.2**	Conglomerates are exposed in *roadcut* on right.

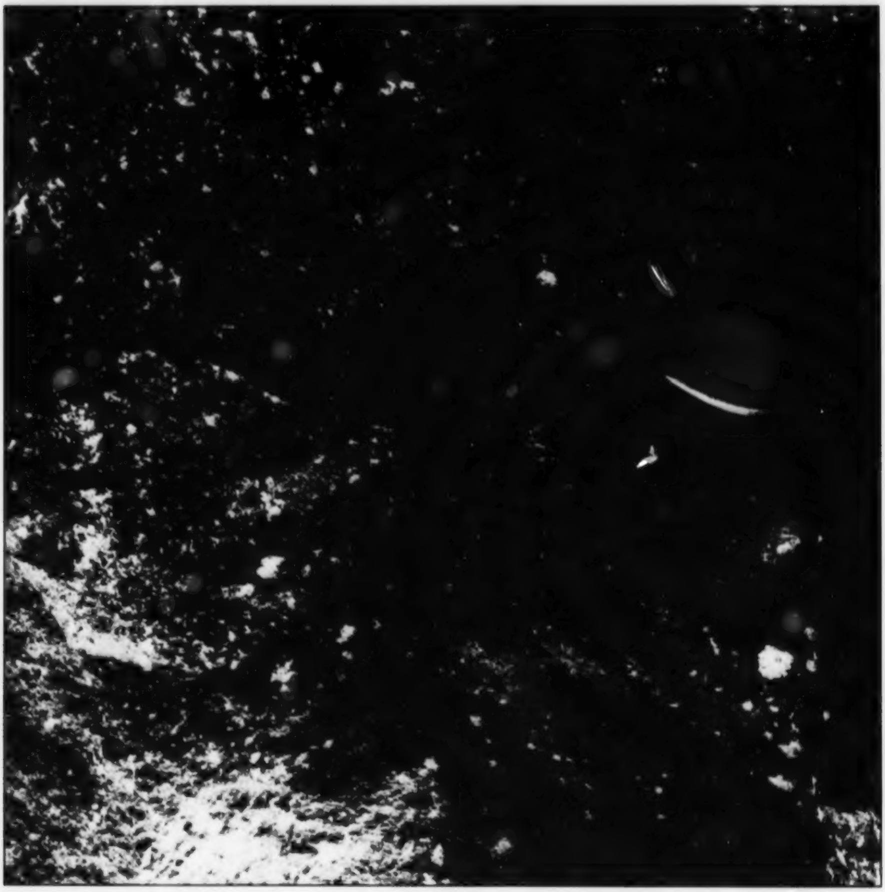


Plate 22

Diabase porphyry in a roadcut on Highway 66 West at **km 11.4**. (GSC 161451)

km	**40.2**	Junction. Highway 65 to Elk Lake; continue along Highway 66.
km	**44.9**	Matachewan, at the bridge over the Montreal River. The site of Fort Matachewan, the former trading post operated by the Hudson's Bay Company, is located on the east side of the Montreal River, about 6 km north of this bridge. Highway 66 continues as Highway 566 at Matachewan.
km	**46.2**	*Cobalt conglomerate* is exposed at intervals along the highway to **km 46.7**.
km	**47.8**	Junction (on left), Mistinikon Lake Road. This is the turnoff to the Young-Davidson mine (page 107), the Mattarrow mine (page 108), and the Yarrow barite mine (page 110).
km	**48.1**	Turnoff (right) to the Matachewan Consolidated mine (page 111).
km	**49.7**	Junction, single-lane road (on left) to Ethel copper occurrence (page 111).
km	**51.3**	Junction, single-lane road to Ryan Lake.
km	**51.5**	Ryan Lake mine on left (page 112).
km	**57.6**	Bridge over Mistinikon Lake narrows.
km	**62.6**	Beaudin Lake on right.
km	**65.6**	Powell Lake on right.
km	**70.8**	Highway 566 ends at the junction of two roads. The Rahn Lake road leads southwest with access to Ashley mine (page 113), Bannockburn (Matachewan) porphyry occurrence (page 113) and Rahn Lake mine (page 115).

Maps (T): 41 P Gogama
42 A Timmins
(G): P264 Flavelle Sharp area, district of Timiskaming (Ontario Geological Survey, 1:31 680)
2078 Holmes-Burt area, Timiskaming district (Ontario Geological Survey, 1:31 680)
2110 Powell and Cairo townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Yarrow iron occurrence

HEMATITE

In quartz

Hematite occurs as radiating columnar aggregates forming botryoidal masses in quartz lenses enclosed by Cobalt conglomerate and quartzite. Specular hematite is also present.

km	40.2	Junction. Highway 65 to Elk Lake; continue along Highway 66.
km	44.9	Matachewan, at the bridge over the Montreal River. The site of Fort Matachewan, the former trading post operated by the Hudson's Bay Company, is located on the east side of the Montreal River, about 6 km north of this bridge. Highway 66 continues as Highway 566 at Matachewan.
km	46.2	*Cobalt conglomerate* is exposed at intervals along the highway to km 46.7.
km	47.8	Junction (on left), Mistinikon Lake Road. This is the turnoff to the Young-Davidson mine (page 107), the Mattarrow mine (page 108), and the Yarrow barite mine (page 110).
km	48.1	Turnoff (right) to the Matachewan Consolidated mine (page 111).
km	49.7	Junction, single-lane road (on left) to Ethel copper occurrence (page 111).
km	51.3	Junction, single-lane road to Ryan Lake.
km	51.5	Ryan Lake mine on left (page 112).
km	57.6	Bridge over Mistinikon Lake narrows.
km	62.6	Beaudin Lake on right.
km	65.6	Powell Lake on right.
km	70.8	Highway 566 ends at the junction of two roads. The Rahn Lake road leads southwest with access to Ashley mine (page 113), Bannockburn (Matachewan) porphyry occurrence (page 113) and Rahn Lake mine (page 115).

Maps (T): 41 P Gogama
42 A Timmins
(G): P264 Flavelle Sharp area, district of Timiskaming (Ontario Geological Survey, 1:31 680)
2078 Holmes-Burt area, Timiskaming district (Ontario Geological Survey, 1:31 680)
2110 Powell and Cairo townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Yarrow iron occurrence

HEMATITE

In quartz

Hematite occurs as radiating columnar aggregates forming botryoidal masses in quartz lenses enclosed by Cobalt conglomerate and quartzite. Specular hematite is also present.

The deposit was staked as the LaBrosse claims and prospected in about 1914. It has been exposed by pits about 400 m northwest of Sisseney (Nest) Lake and about 6.4 km south of Matachewan. Access is by boat from Matachewan. See Map 11, No. 10, on page 109.

Refs.: 22 p. 238; 171 p. 478-479.

Maps (T): 41 P/15 Matachewan
(G): 1793 Matachewan, Timiskaming district, Ontario (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Young-Davidson mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, MOLYBDENITE, SPECULARITE, TOURMALINE, MAGNETITE, BARITE

In red syenite porphyry

Plate 23

Cobalt conglomerate in a roadcut on Highway 11 at Kenogami Lake (km 98.9). (GSC 161450)

Native gold occurred as grains in quartz veinlets occupying fine fractures in syenite porphyry, and in pyrite disseminations in porphyry at this former gold producer. The deposit also contained chalcopyrite, galena, molybdenite, scheelite, specularite, tourmaline, magnetite, and barite. Syenite on the property varies from grey to brown to red, but ore was associated only with red syenite. Magnetite, pyrite, apatite, titanite, and zircon are found as accessory minerals in the syenite. A rock composed of green mica, quartz, and a carbonate has been reported from the deposit.

The deposit was discovered in 1916 by prospector Jake Davidson after he had found some gold-bearing rock on Davidson Creek. The discovery consisted of sparsely mineralized quartz in rusty carbonatized greenstone containing green mica. It was originally investigated by trenching in 1917. Porcupine Goldfields Development and Finance Company Limited, a British company formed to develop gold mines in the Porcupine district, conducted a program of development in 1923-1924; a shaft was sunk to 61 m and a mining plant was installed, but operations were discontinued due to the low grade ore. A few years later, the deposit became the property of Young-Davidson Mines Limited, which entered into an agreement with Hollinger Consolidated Gold Mines Limited to develop the orebody. Development commenced in 1933 and production, in 1934. A mill was built on the site. To the end of 1955 when operations ceased, the mine produced 15 551 500 g of gold and about 4 000 000 g of silver.

The mine was serviced by an open pit and a 328 m shaft. It is 3.5 km west of Matachewan. See Map 11, No. 6, on page 109. To reach it, follow the road log to the Yarrow barite mine (page 110).

Refs.: 22 p. 232-234; 35 p. 42-43, 49; 47 p. 31-36; 114 p. 23, 39-43, 53; 133 p. 633-637; 190 p. 39; 191 p. 132; 226 p. 74, 182; 234 p. 271.

Maps (T): 41 P/15 Matachewan
(G): 2110 Powell and Cairo townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Mattarrow mine

GALENA, SPHALERITE, PYRITE, PYRRHOTITE

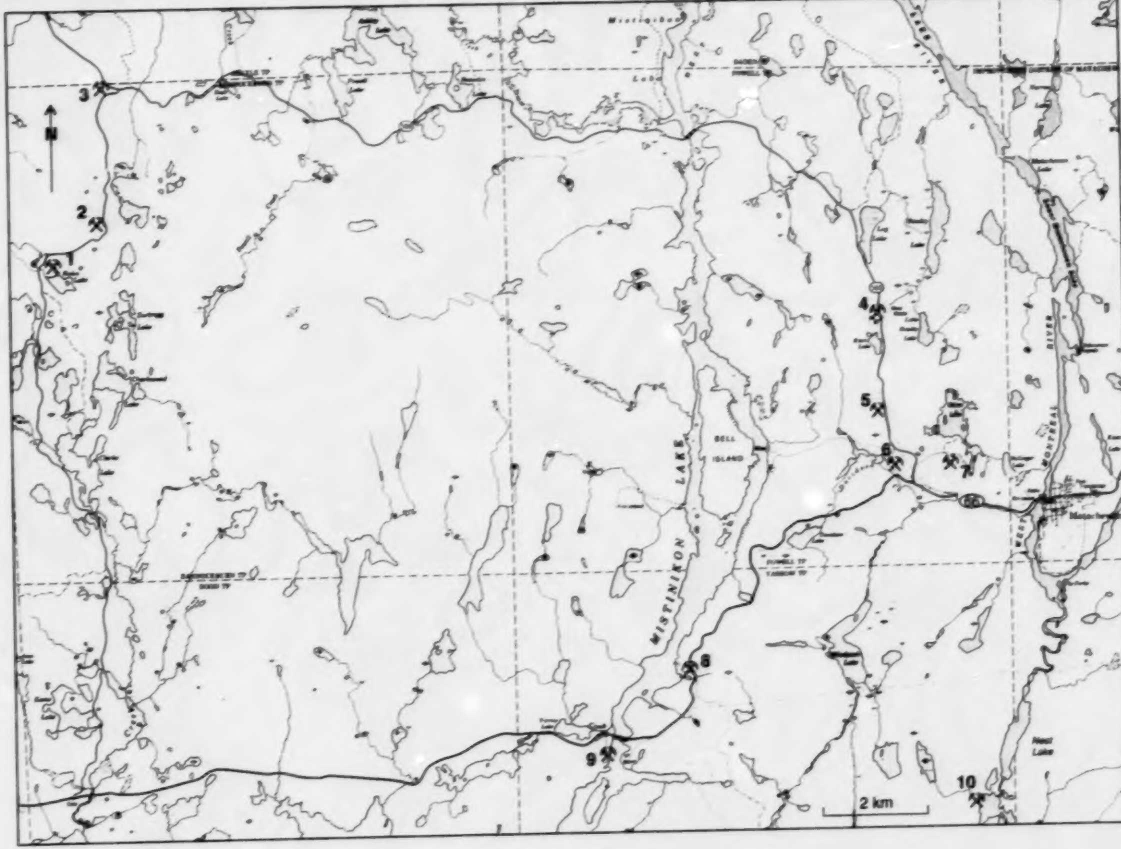
In iron-formation

Galena and sphalerite occur in carbonate veins and as tiny veinlets in iron-formation containing pyrite and pyrrhotite.

The deposit was investigated by diamond drilling between 1948 and 1950 by Mattarrow Lead Mines Limited and became a producer in 1952 under the direction of Matachewan Consolidated Mines Limited. When operations ceased in 1953, the mine had produced about 1 182 500 kg of lead, almost 453 000 kg of zinc, and some silver. The deposit was mined from a shaft 106 m deep.

The mine is on the east side of Mistinikon Lake, about 9.5 km west of Matachewan. See Map 11, No. 8, on page 109. To reach it, follow the road log to the Yarrow barite mine on page 110.

Part of 41 P/15 & 42 A/2



Map 11. Matachewan area

1. Rahn Lake mine 2. Bannockburn porphyry occurrence 3. Ashley mine
4. Ryan Lake mine 5. Ethel copper occurrence 6. Young-Davidson mine
7. Matachewan Consolidated mine 8. Mattarrow mine
9. Yarrow barite mine 10. Yarrow iron occurrence

Maps (T): 41 P/15 Matachewan
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)

Yarrow barite mine

BARITE, HEMATITE, CHALCOPYRITE

In veins cutting greywacke

Barite is associated with small amounts of quartz and calcite and contains traces of specular hematite and chalcopyrite. It is white to grey, or tinted purplish due to the presence of fine particles of hematite. It is finely granular and some of it is banded.

Barite veins were originally discovered in the bed of Yarrow Creek on the western shore of Mistinikon Lake; more important veins were staked in 1917 along the shoreline about 600 m south of the mouth of the creek. The deposit was exposed by trenching and stripping, and a shaft was put down by Ontario Barium Company Limited between 1919 and 1920. In 1933, H.D. Glendinning removed 0.5 t of ore for testing. Extender Minerals of Canada Limited has worked the deposit since 1967. The workings consist of an open pit and a decline.

The mine is on the west side of Mistinikon Lake, about 12.5 km west of Matachewan. See Map 11, No. 9, on page 109.

Road log from Matachewan:

km	0	Highway 566 bridge over West Montreal River; proceed west along Highway 566.
	2.9	Junction. Highway 566 turns north. Follow the road leading west. This junction is at **km 47.8** on the road log for highways 66 and 566 on page 106.
	3.2	Junction, road on right leading to Mistinikon Lake. Follow this road for 0.3 km to the Young-Davidson mine (page 107). The road log continues along the main road on left.
	8.5	Turnoff (right) leading west 0.4 km to Mattarrow mine (page 108). The road log continues along the main road.
	12.2	Junction, road to Yarrow barite mine; turn left (south).
	12.5	Yarrow barite mine.

Refs.: 22 p. 238; 68 p. 21-24; 124a p. 278.

Maps (T): 41 P/15 Matachewan
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)

Matachewan Consolidated mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, TOURMALINE, SCHEELITE, HEMATITE, BARITE, EPIDOTE, AMPHIBOLE, CALCITE, MICA

In syenite porphyry and in schist

At this deposit, native gold was associated with quartz and pyrite in light grey schist and in grey syenite porphyry, the highest grade ore occurring in the schist. Minor amounts of chalcopyrite, tourmaline, and scheelite have been reported. Crystals of pyrite, averaging about 5 mm in diameter, are common in specimens in the rock dump. Also noted were specular hematite with barite (colourless, transparent platy aggregates) and calcite in syenite, and epidote associated with fibrous dark green amphibole. White massive calcite fluoresces bright pink when exposed to ultraviolet rays. Green mica occurs in grey to brownish carbonate schist.

The gold deposit was discovered in 1917 by Sam Otisse who, with his brother, explored it the same year by trenching. The property was sold in 1918 to Colorado Ontario Development Company, which continued exploration, subsequently outlining a number of orebodies. The company reorganized and became Matachewan Gold Mines Limited in 1919, and Matachewan Canadian Gold Limited in 1923. A shaft was sunk to 58 m. Matachewan Consolidated Mines Limited acquired the property in 1933 and brought it into production in 1934. The mine was closed in 1953 after having yielded 11 521 390 g of gold and 4 158 782 g of silver. From 1979 to 1982, Pamour Porcupine Mines Limited produced 173 455.5 g of gold.

The mine consisted of one shaft sunk to a depth of 748 m, two shallow shafts, and an open pit. The mill and other buildings have been dismantled. There is a large rock dump on the property.

Access is by a road leading 0.5 km east from Highway 566 at **km 48.1** (see road log on page 106). See Map 11, No. 7, on page 109.

Refs.: 22 p. 234-235; 35 p. 42-43, 49-52; 47 p. 36-42; 114 p. 23, 32-36; 226 p. 104, 223; 234 p. 162.

Maps (T): 41 P/15 Matachewan

(G): 2110 Powell and Cairo townships, Timiskaming district (Ontario Geological Survey, 1:31 680)

1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Ethel copper occurrence

CHALCOPYRITE, PYRITE, MALACHITE, GALENA, SPHALERITE, QUARTZ CRYSTALS, CHLORITE, GOETHITE, MICA

In quartz veins cutting arkose and syenite porphyry

Chalcopyrite and pyrite occur in massive quartz. The deposit has been exposed by pits and trenches. Malachite is commonly found as a coating on sulphide-bearing quartz. Galena and sphalerite have been reported. Microscopic crystals of quartz were noted in cavities in massive quartz. Other minerals found in the quartz are chlorite, goethite, and light green mica.

The deposit is on the south side of a bluff, 0.3 km (via a single-lane road) west of Highway 566 at **km 49.7** (see road log on page 106). It was explored by Ethel Copper Mines Limited between 1955 and 1957, and by Stancop Mines Limited in 1964; the latter company mined a few tonnes of ore and recovered some copper, gold, and silver. See Map 11, No. 5, on page 109.

Refs.: 114 p. 46-47; 172 p. 368-369.

Maps (T): 41 P/15 Matachewan
(G): 2110 Powell and Cairo townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
1793 Matachewan, Timiskaming district, Ontario (GSC, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Ryan Lake mine

CHALCOPYRITE, MOLYBDENITE, PYRITE, PYRRHOTITE, BORNITE, HEMATITE, COVELLITE, MALACHITE, AMPHIBOLE, CALCITE, GYPSUM, ZEOLITE, TALC

In sheared serpentinized peridotite and in syenite porphyry

Chalcopyrite and molybdenite were the ore minerals at this former molybdenum-copper-silver-gold producer. Molybdenite occurred as flakes and films in quartz veins and lenses and in sheared rocks. Massive pyrite, pyrrhotite, and bornite, platy specular hematite, and covellite occur with ore minerals in the rock dumps. Minerals that have formed encrustations on specimens include bright green botryoidal and platy malachite, white fibrous to hair-like amphibole, colourless rhombohedral crystals of calcite, and snow-white granular gypsum. Vugs lined with microscopic crystals colourless quartz, colourless calcite, chalcopyrite, pink feldspar, and a white fibrous zeolite have been reported in massive quartz. Light green to medium green fibrous talc occurs in quartz. White massive calcite found in the dumps fluoresces dark pink when exposed to long ultraviolet rays. Specimens of an attractive reddish-pink syenite were found on the property.

The deposit was developed by opencuts and by a shaft, 140 m deep. Investigation was initiated by Ryan Lake Mines Limited in 1947. A concentrating mill was put into operation in 1950 and the concentrates were shipped to the Noranda smelter. The original operator was renamed in 1951 New Ryan Lake Mines Limited (in 1951) and Min-Ore Mines Limited in 1955. Pax International Mines Limited operated the deposit between 1960 and 1964, recovering copper and molybdenite from tailings of former operations. Total production from the deposit amounted to nearly 2 265 000 kg of copper and approximately 4980 kg of molybdenum, 1 119 708 g of silver, and 40 434 g of gold.

The mine is on the west side of Highway 566 at **km 51.5** (see road log on page 106). See Map 11, No. 4, on page 109.

Refs.: 114 p. 37-38; 172 p. 369; 210 p. 87-98.

Maps (T): 41 P/15 Matachewan
(G): 2110 Powell and Cairo townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Ashley mine

NATIVE GOLD, PYRITE, ALTAITE, SPHALERITE, CHALCOPYRITE, GALENA, HEMATITE, KRENNERITE

In quartz veins cutting volcanic rocks

Native gold occurred as fine particles closely associated with pyrite and altaite in fractures in quartz. Coarse crystals of sphalerite, massive chalcopyrite, finely granular galena, and specular hematite were also reported from the vein. Small amounts of krennerite were associated with altaite.

The gold-bearing vein outcropped in low ground on the west side of a knoll where Bert Ashley found it in October 1930 and staked it for the Mining Corporation of Canada Limited. It was the first important gold discovery in Bannockburn Township and vicinity, and the only one to become a producer. In the winter of 1930-1931, when diamond drilling indicated favourable ore, Ashley Gold Mining Corporation Limited was formed to develop it. Mining and milling equipment was rushed to the site and production began in 1932, the earliest production in the Matachewan district. Ore was hoisted through an inclined shaft from which underground workings extended to a depth of 229 m. When the mine closed in 1936 due to exhaustion of the ore, gold valued at $1,624,012.08 had been mined.

The mine is about 26 km west of Matachewan. See Map 11, No. 3, on page 109.

Road log from the end of Highway 566 at **km 70.8** (see road log on page 106):

km	0	Junction, at the end of Highway 566; proceed onto the road on left leading southwest to Rahn Lake.
	0.3	Turn right onto a trail leading west.
	0.4	Ashley mine.

Refs.: 154 p. 1, 13-17; 177 p. 100; 226 p. 18-19.

Maps (T): 42 A/2 Radisson Lake
(G): 41a Bannockburn gold area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:47 520)
1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Bannockburn (Matachewan) porphyry occurrence

PORPHYRY

In dyke in volcanic rock

The porphyry is a striking ornamental rock with a fine grained dark grey to almost black matrix enclosing white to reddish- and greenish-white phenocrysts of anorthoclase feldspar with an average length of 1 cm but reaching 2 cm. The feldspar commonly displays a zoned or banded texture. In places, the dark background has a greenish tint due to the presence of amphibole and epidote. The rock takes a good polish and is used for ornamental purposes.

The feldspar porphyry dyke is reported to be 6 m wide by at least 61 m long and trends north-south. It has been exposed by blasting at the side of a small knoll.

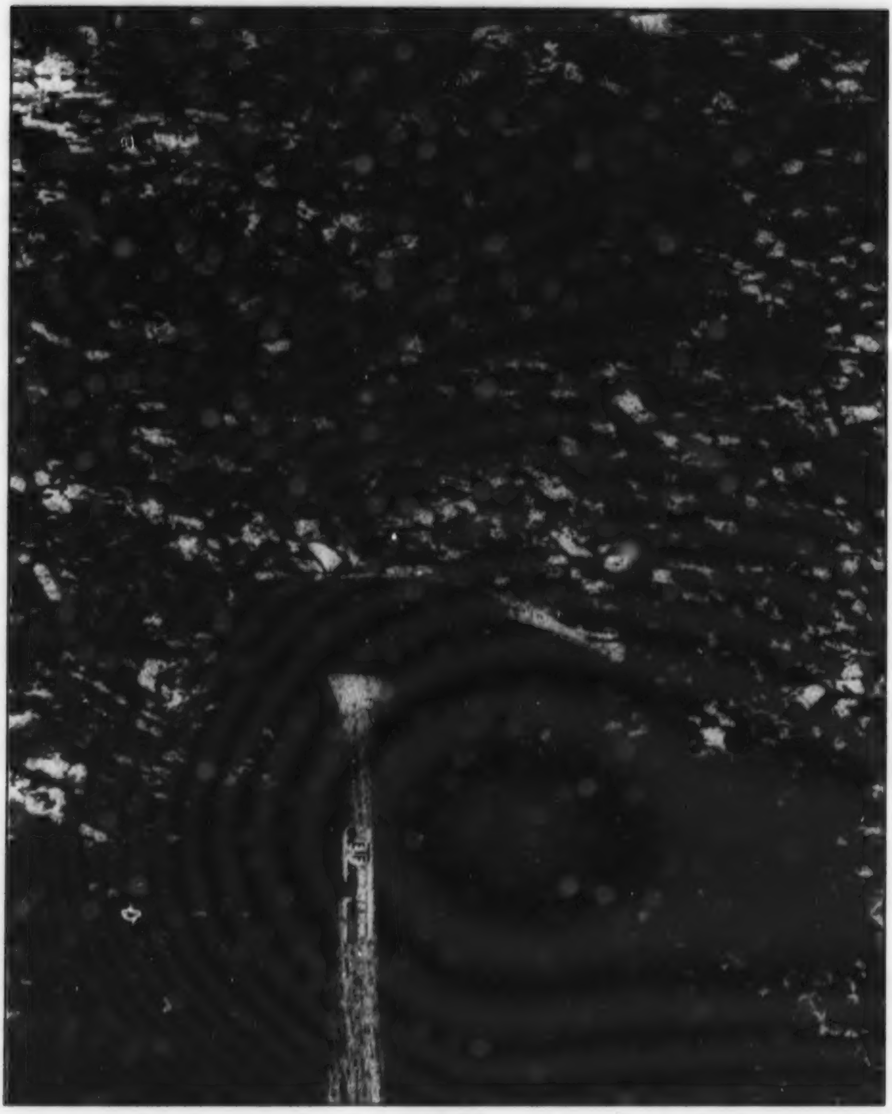


Plate 24

Bannockburn (Matachewan) porphyry exposed at the side of a knoll in Bannockburn Township. (GSC 161449)

The occurrence is about 29 km west of Matachewan. See Map 11, No. 2, on page 109.

Road log from the end of Highway 566 at **km 70.8** (see road log on page 106):

km	0	Junction, at the end of Highway 566; proceed onto the road on left leading southwest to Rahn Lake.
	0.3	Turnoff to Ashley mine; continue straight ahead.
	3.2	Junction of a trail on right (at a dip in the road); proceed west along this trail.
	3.3	Porphyry occurrence.

Ref.: 154 p. 8-9.

Maps (T): 41 P/15 Matachewan

(G): 41a Bannockburn gold area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:47 520)

1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Rahn Lake mine

CHRYSOTILE, SERPENTINE, MAGNETITE, PYRITE, PYRRHOTITE, ARAGONITE, CALCITE

In peridotite

This deposit was at one time worked for asbestos. Light green cross-fibre asbestos occurs in veins averaging 10 mm in width. The veins cut olive-green to nearly black massive serpentine containing small grains of magnetite. Patches of pyrite and pyrrhotite were noted in calcite. Crusts of columnar and foliated calcite and coatings of dull greyish-white aragonite occur on serpentine.

The deposit was discovered sometime before 1910 by George Rahn of Erie, Pennsylvania. In 1922, Empire Asbestos Company Limited explored it using an inclined shaft. Rahn Lake Mines Corporation mined asbestos from 1934 to 1939. The asbestos was originally milled at a pilot mill on the property, and later at the company's mill at Elk Lake. The production shaft was 43 m deep; another shaft was sunk to a depth of 17 m.

The mine is near Rahn Lake. There is a small rock dump and some fallen buildings on the site. See Map 11, No. 1, on page 109.

Road log from Highway 566 at **km 70.8** (see road log on page 106):

km	0	Junction, at the end of Highway 566; turn left (southwest) onto the road to Rahn Lake.
	0.3	Turnoff (right) to Ashley mine; continue straight ahead.
	3.2	Turnoff to the Bannockburn porphyry occurrence; continue straight ahead.
	4.5	Junction, road to Rahn Lake; turn left.
	4.75	Rahn Lake mine on left.

Refs.: 35 p. 39-40; 154 p. 11, 12; 211 p. 49-50.

Maps (T): 41 P/15 Matachewan

(G): 41a Bannockburn gold area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:47 520)

1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

KENOGAMI LAKE TO MATHESON

km	**121.3**	**Junction of Highway 11 and the road to Bourkes (see the Cobalt to Matheson road log on page 5).**

Bourkes mine

NATIVE GOLD, PYRITE, PETZITE, CHALCOPYRITE, GALENA, MOLYBDENITE, EPIDOTE

In quartz-carbonate veins and lenses in sheared volcanic rocks

Rich concentrations of native gold in quartz were encountered during mining operations at this old gold mine. Pyrite and less commonly chalcopyrite, galena, and molybdenite were associated with gold. Petzite, a grey metallic mineral, has been reported to occur with native gold. Pyrite as granular masses and as crystals averaging 5 mm in diameter and epidote associated with colourless quartz and with white calcite are common in the rock dumps.

The deposit was found by Oscar Anderson in the fall of 1916. While engaged in clearing his homestead, Mr. Anderson uncovered a vein containing a yellow metal which a prospector, J. Burns, identified as gold. The vein occurred in a rusty-weathered quartz-schist band in greenstone at the bend in the Whiteclay River. Stripping revealed several showings of native gold in the decomposed veins. Bourkes Mines Limited carried out initial development and mining between 1917 and 1920; a shaft was put down to 122 m on the main vein, and a small shipment of ore was made to the McIntyre mill in Timmins. Small amounts of ore were mined by Bourkes Syndicate (1936, 1937) and Mesabi Gold Mines Limited (1938). Davidor Gold Mines Limited operated a test mill to process some of the ore in 1946-1947.

Road log from Highway 11 at **km 121.3** (see road log on page 6):

km	0	Junction, turn right (east) onto the road to Bourkes.
	1.5	Bridge over Whiteclay River.
	1.6	Junction, turn left (north) onto a single-lane road paralleling railway tracks.
	2.1	Bourkes mine.

Refs.: 21 p. 249-250; 114a p. 17-18; 214 p. 53-55; 224 p. 500.

Maps (T): 42 A/8 Ramore
(G): 2215 Benoit and Maisonville townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 139.9 Junction of highways 572 and 11. Highway 572 provides access to Ross mine and Kelore mine (see the Cobalt to Matheson road log on page 6.)

Ross mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, GALENA, TENNANTITE, NATIVE SILVER, NATIVE COPPER, PEARCEITE, PROUSTITE, ARGENTITE, MALACHITE, AZURITE, CUPRITE, RHODOCHROSITE, MARIPOSITE

In quartz and quartz-carbonate veins cutting volcanic rocks and syenite

This mine is a former gold, silver, and copper producer. It is located on the former Ross farm. Outcrops on that property received the attention of prospectors for some time following the discoveries of gold-bearing rocks in adjacent townships. It was only after Frank Tremblay sampled the outcrops in 1933 that the occurrence of gold on the property became known. That year, Hollinger Consolidated Gold Mines Limited (name changed in 1968 to Hollinger Mines Limited) undertook a program of surface and underground exploration. The company mined the deposit from 1936 to 1976. Subsequent operators were Pamour Porcupine Mines Limited (1976-1987) and Giant Yellowknife Mines Limited (1987-1989). The mine was serviced by a 1006 m shaft with an underground decline reaching a depth of 1029 m. Production amounted to 30 973 362 g of gold, 48 047 758 g of silver, and 2301 t of copper.

The mine is in Holtyre. See Map 12, No. 22, on page 119.

Road log from Highway 11 at **km 139.9** (see road log on page 6):

km	0	Junction, highways 11 and 572; proceed east along Highway 572 toward Ramore.
	0.8	Ramore, at a junction; turn left (north).
	8.5	Holtyre, at a junction; turn left continuing along Highway 572.
	9.3	Junction; turn left (west).
	9.7	Junction; turn right (north).
	10.4	Ross mine.

Refs.: 35 p. 39-40; 154 p. 11, 12; 211 p. 49-50.

Maps (T): 41 P/15 Matachewan
(G): 41a Bannockburn gold area, district of Timiskaming, Ontario (Ontario Geological Survey, 1:47 520)
1793 Matachewan, Timiskaming district, Ontario (Geological Survey of Canada, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

KENOGAMI LAKE TO MATHESON

km 121.3 Junction of Highway 11 and the road to Bourkes (see the Cobalt to Matheson road log on page 5).

Bourkes mine

NATIVE GOLD, PYRITE, PETZITE, CHALCOPYRITE, GALENA, MOLYBDENITE, EPIDOTE

In quartz-carbonate veins and lenses in sheared volcanic rocks

Rich concentrations of native gold in quartz were encountered during mining operations at this old gold mine. Pyrite and less commonly chalcopyrite, galena, and molybdenite were associated with gold. Petzite, a grey metallic mineral, has been reported to occur with native gold. Pyrite as granular masses and as crystals averaging 5 mm in diameter and epidote associated with colourless quartz and with white calcite are common in the rock dumps.

The deposit was found by Oscar Anderson in the fall of 1916. While engaged in clearing his homestead, Mr. Anderson uncovered a vein containing a yellow metal which a prospector, J. Burns, identified as gold. The vein occurred in a rusty-weathered quartz-schist band in greenstone at the bend in the Whiteclay River. Stripping revealed several showings of native gold in the decomposed veins. Bourkes Mines Limited carried out initial development and mining between 1917 and 1920; a shaft was put down to 122 m on the main vein, and a small shipment of ore was made to the McIntyre mill in Timmins. Small amounts of ore were mined by Bourkes Syndicate (1936, 1937) and Mesabi Gold Mines Limited (1938). Davidor Gold Mines Limited operated a test mill to process some of the ore in 1946-1947.

Road log from Highway 11 at **km 121.3** (see road log on page 6):

km	0	Junction, turn right (east) onto the road to Bourkes.
	1.5	Bridge over Whiteclay River.
	1.6	Junction, turn left (north) onto a single-lane road paralleling railway tracks.
	2.1	Bourkes mine.

Refs.: 21 p. 249-250; 114a p. 17-18; 214 p. 53-55; 224 p. 500.

Maps (T): 42 A/8 Ramore
(G): 2215 Benoit and Maisonville townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 139.9 Junction of highways 572 and 11. Highway 572 provides access to Ross mine and Kelore mine (see the Cobalt to Matheson road log on page 6.)

Ross mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, GALENA, TENNANTITE, NATIVE SILVER, NATIVE COPPER, PEARCEITE, PROUSTITE, ARGENTITE, MALACHITE, AZURITE, CUPRITE, RHODOCHROSITE, MARIPOSITE

In quartz and quartz-carbonate veins cutting volcanic rocks and syenite

This mine is a former gold, silver, and copper producer. It is located on the former Ross farm. Outcrops on that property received the attention of prospectors for some time following the discoveries of gold-bearing rocks in adjacent townships. It was only after Frank Tremblay sampled the outcrops in 1933 that the occurrence of gold on the property became known. That year, Hollinger Consolidated Gold Mines Limited (name changed in 1968 to Hollinger Mines Limited) undertook a program of surface and underground exploration. The company mined the deposit from 1936 to 1976. Subsequent operators were Pamour Porcupine Mines Limited (1976-1987) and Giant Yellowknife Mines Limited (1987-1989). The mine was serviced by a 1006 m shaft with an underground decline reaching a depth of 1029 m. Production amounted to 30 973 362 g of gold, 48 047 758 g of silver, and 2301 t of copper.

The mine is in Holtyre. See Map 12, No. 22, on page 119.

Road log from Highway 11 at **km 139.9** (see road log on page 6):

km	0	Junction, highways 11 and 572; proceed east along Highway 572 toward Ramore.
	0.8	Ramore, at a junction; turn left (north).
	8.5	Holtyre, at a junction; turn left continuing along Highway 572.
	9.3	Junction; turn left (west).
	9.7	Junction; turn right (north).
	10.4	Ross mine.

Alternate access from Highway 101 east of Matheson:

km 0 Junction, highways 101 and 572; proceed south onto Highway 572.

3.25 *Hislop gold mine*. A quartz vein carrying native gold was explored by a 26 m shaft around 1919. This old shaft is located about 50 m east of Highway 572 at km 3.25. In the 1930s, Hislop Gold Mines Limited sank a shaft (52 m deep) on another gold-bearing quartz vein 500 m southwest of the first shaft, on the west side of the highway. Visible gold was reported from this vein. No production is recorded from these openings. See Map 12, No. 24, on page 119.

4.9 Junction, Kelore mine road; continue straight ahead. The Kelore mine is described below.

7.4 Junction; turn right (west).

7.9 Junction; turn right (north).

8.6 Ross mine.

Refs.: 6a p.1001-1017, 1035-1046; 51 p. 76; 92 p.64-69; 93 p. 570-579; 124b p.267; 129 p.17-23, 27-29; 149 p. 33, 34, 39-44; 251 p. 151.

Maps (T): 42 A/8 Ramore
(G): 1955-5 Township of Hislop, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 404 Hislop Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Kelore mine

NATIVE GOLD, PYRITE

In shear zones at the contact of syenite and volcanic rocks

Native gold and pyrite occurred in quartz veins. The syenite is coarse textured, pink to purplish, and, in places, porphyritic.

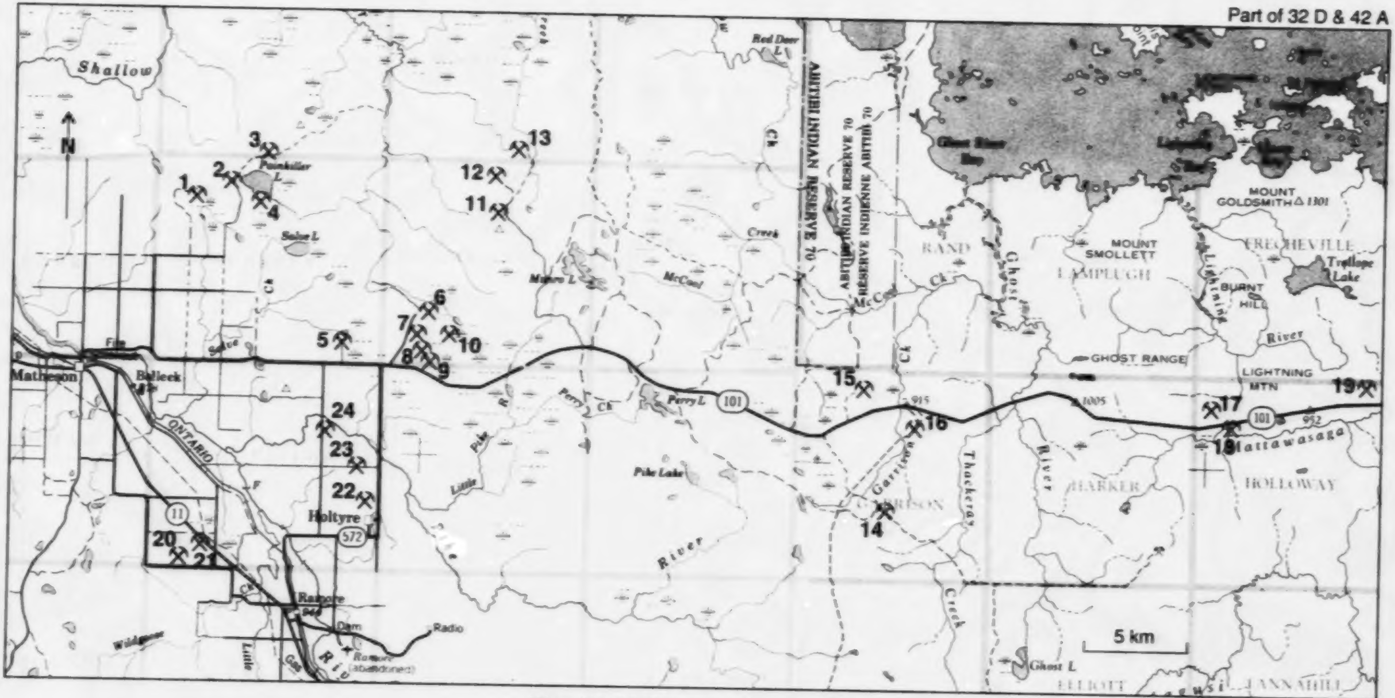
The deposit was originally explored for gold in the 1930s. In 1939-1940, Kelrowe Gold Mines Limited sank an exploration shaft to 30 m. In 1946-1947, Kelwren Gold Mines Limited deepened the shaft to 145 m. Further exploration of the deposit was done by Kelore Mines Limited (1948-1950), Hollinger Mines Limited (1973-1976), and Goldpost Resources Incorporated (1986-1989). Two decline ramps were driven 422 m and 998 m respectively from the surface during the final period of exploration. No production is recorded from this deposit.

The mine is north of Holtyre and north of the Ross mine. See Map 12, No. 23, on page 119.

Road log from Highway 11:

km 0 Junction, Highway 11 and Highway 572; proceed east along Highway 572 and follow the road log given for the Ross mine (page 117).

9.3 Junction, road on left leading west toward the Ross mine; continue straight ahead (north).



Map 12. Matheson - Ramore area

1. Argyll mine
2. Lucky Ben mine
3. Aljo mine
4. Blue Quartz mine
5. Stewart-Abate mine
6. Munro mine
7. Burton-Munro occurrence
8. Gold Pyramid mine
9. White-Guyatt mine
10. Croesus mine
11. Centre Hill mine
12. Potterdoal mine
13. Hedman mine
14. Buffonta mine
15. Bird mine
16. Garrcon mine
17. Teddy Bear mine
18. Holt-McDermott mine
19. East Zone mine
20. Golden Arrow mine
21. Vimy mine
22. Ross mine
23. Kelore mine
24. Hislop mine

km 11.7 Junction (on left), partly overgrown single-lane mine road; follow this road west.

12.7 Kelore mine.

An alternate route is via Highway 572 leading south from Highway 101 east of Matheson: the mine road leads west from Highway 572 at a point 4.9 km south of the junction of highways 101 and 572.

Refs.: 6a p. 989-1000; 51 p. 75; 148 p. 51-52; 149 p. 45-47.

Maps (T): 42 A/8 Ramore
(G): 1955-5 Township of Hislop, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 404 Hislop Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 142.4 Junction of Highway 11 and a road leading west (see the Cobalt to Matheson road log on page 6).

Golden Arrow mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, SPHALERITE

In veins in basalt and dioritic rock

Mineralization consisted of fine particles of native gold and pyrite in quartz and in quartz-calcite veins; associated minerals included chalcopyrite, galena, and sphalerite.

The deposit was explored in 1934-1936 by Golden Arrow Mining Company Limited. The company sank No. 1 shaft to 14.6 m and did some trenching. Between 1945 and 1947, Golden Arrow Mines Limited resumed exploration by sinking No. 2 shaft to 131 m in another zone 730 m east of the original shaft. Between 1974 and 1982, Pamour Porcupine Mines Limited developed the deposit using an open pit. Production amounted to 530 150.6 g of gold.

The mine is 6 km northwest of Ramore. See Map 12, No. 20, on page 119.

Road log from Highway 11 at **km 142.4** (see road log on page 6):

km 0 Intersection of Highway 11 and roads leading west and north; proceed onto the road leading west.

3.4 Junction; turn right (north).

4.2 Golden Arrow mine, open pit and No. 2 shaft area.

Refs.: 6a p. 969-975; 51 p. 73-74; 149 p. 35-37.

Maps (T): 42 A/8 Ramore
(G): 1955-5 Township of Hislop, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 404 Hislop Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 144.9 Junction of Highway 11 and a road leading west to Vimy mine (see the Cobalt to Matheson road log on page 6).

Vimy mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA

In fracture zone in basalt, syenite, and lamprophyre

Native gold was associated with fine grained pyrite in quartz veins and in the host syenite and basalt. Visible gold occurred rarely. Chalcopyrite and galena were associated with pyrite.

Vimy Gold Mines Limited explored the deposit for gold in 1934-1935. The openings consisted of a trench, an open pit (61 m long and up to 6 m wide), and a shaft 23 m deep. A mill was built on the site but was closed soon after due to lack of a dependable water supply. No production is recorded from this mine.

The mine is about 6 km northwest of Ramore. Access is by a road, 0.3 km long, leading west from Highway 11 at **km 144.9**. See Map 12, No. 21, on page 119.

Refs.: 6a p. 1028-1032; 51 p. 77; 129 p. 29-31.

Maps (T): 42 A/8 Ramore
(G): 1955-5 Township of Hislop, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 404 Hislop Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 154.8 Matheson, at the junction of Highway 11 and Highway 101/11 West. The road log for occurrences along Highway 101 West to the Timmins area is given on page 137. Occurrences along Highway 101 east of Matheson are described in the following text.

km 11.7 Junction (on left), partly overgrown single-lane mine road; follow this road west.

12.7 Kelore mine.

An alternate route is via Highway 572 leading south from Highway 101 east of Matheson: the mine road leads west from Highway 572 at a point 4.9 km south of the junction of highways 101 and 572.

Refs.: 6a p. 989-1000; 51 p. 75; 148 p. 51-52; 149 p. 45-47.

Maps (T): 42 A/8 Ramore

(G): 1955-5 Township of Hislop, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 404 Hislop Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 142.4 Junction of Highway 11 and a road leading west (see the Cobalt to Matheson road log on page 6).

Golden Arrow mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, SPHALERITE

In veins in basalt and dioritic rock

Mineralization consisted of fine particles of native gold and pyrite in quartz and in quartz-calcite veins; associated minerals included chalcopyrite, galena, and sphalerite.

The deposit was explored in 1934-1936 by Golden Arrow Mining Company Limited. The company sank No. 1 shaft to 14.6 m and did some trenching. Between 1945 and 1947, Golden Arrow Mines Limited resumed exploration by sinking No. 2 shaft to 131 m in another zone 730 m east of the original shaft. Between 1974 and 1982, Pamour Porcupine Mines Limited developed the deposit using an open pit. Production amounted to 530 150.6 g of gold.

The mine is 6 km northwest of Ramore. See Map 12, No. 20, on page 119.

Road log from Highway 11 at **km 142.4** (see road log on page 6):

km 0 Intersection of Highway 11 and roads leading west and north; proceed onto the road leading west.

3.4 Junction; turn right (north).

4.2 Golden Arrow mine, open pit and No. 2 shaft area.

Refs.: 6a p. 969-975; 51 p. 73-74; 149 p. 35-37.

Maps (T): 42 A/8 Ramore
(G): 1955-5 Township of Hislop, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 404 Hislop Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 144.9 **Junction of Highway 11 and a road leading west to Vimy mine (see the Cobalt to Matheson road log on page 6).**

Vimy mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA

In fracture zone in basalt, syenite, and lamprophyre

Native gold was associated with fine grained pyrite in quartz veins and in the host syenite and basalt. Visible gold occurred rarely. Chalcopyrite and galena were associated with pyrite.

Vimy Gold Mines Limited explored the deposit for gold in 1934-1935. The openings consisted of a trench, an open pit (61 m long and up to 6 m wide), and a shaft 23 m deep. A mill was built on the site but was closed soon after due to lack of a dependable water supply. No production is recorded from this mine.

The mine is about 6 km northwest of Ramore. Access is by a road, 0.3 km long, leading west from Highway 11 at **km 144.9**. See Map 12, No. 21, on page 119.

Refs.: 6a p. 1028-1032; 51 p. 77; 129 p. 29-31.

Maps (T): 42 A/8 Ramore
(G): 1955-5 Township of Hislop, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 404 Hislop Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 154.8 **Matheson, at the junction of Highway 11 and Highway 101/11 West. The road log for occurrences along Highway 101 West to the Timmins area is given on page 137. Occurrences along Highway 101 east of Matheson are described in the following text.**

MATHESON AREA

Mines along Highway 101 East

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log for occurrences along Highway 101 East from Matheson to the Ontario/Québec border (see road log on page 6):

km	**0**	Matheson, junction highways 101 and 11; proceed east along Highway 101.
km	**4.2**	Junction, road leading north to Argyll (Maude Lake) mine (page 122), Blue Quartz mine (page 123), Lucky Ben mine (page 124), and Aljo mine (page 125).
km	**12.5**	Junction, road leading south to Holtyre.
km	**12.8**	Junction, trail leading north to Stewart-Abate mine (page 126).
km	**15.2**	Junction, Highway 572 to Holtyre. This is an alternate route to Kelore mine (page 118) and Ross mine (page 117).
km	**15.7**	Junction, road leading north to Burton-Munro occurrence and Munro mine (page 126).
km	**16.7**	Junction, road leading north to White-Guyatt mine (page 127), Gold Pyramid mine (page 127), and Croesus mine (page 128).
km	**25.4**	Junction, road leading north to Centre Hill (Potter) mine (page 130), Potterdoal mine (page 130), and Hedman mine (page 131).
km	**33.8**	Junction, road leading south to Buffonta mine (page 132).
km	**37.6**	Junction, road leading south to Buffonta mine (page 132).
km	**38.6**	Junction, road leading north to Bird mine (page 132).
km	**41.9**	Junction, road leading south to Garrcon mine (page 133).
km	**56.6**	Junction, trail leading north to Teddy Bear mine (page 133).
km	**57.6**	Junction, road leading south to Holt-McDermott mine (page 134).
km	**61.2**	Junction, road leading north to East Zone mine (page 134).

Argyll (Maude Lake) mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, SPHALERITE, GALENA, CHALCOPYRITE

In basalt

Mines along Highway 101 East

Each mine is described on the page indicated in parentheses following the name of the mine.

Road log for occurrences along Highway 101 East from Matheson to the Ontario/Québec border (see road log on page 6):

km	0	Matheson, junction highways 101 and 11; proceed east along Highway 101.
km	4.2	Junction, road leading north to Argyll (Maude Lake) mine (page 122), Blue Quartz mine (page 123), Lucky Ben mine (page 124), and Aljo mine (page 125).
km	12.5	Junction, road leading south to Holtyre.
km	12.8	Junction, trail leading north to Stewart-Abate mine (page 126).
km	15.2	Junction, Highway 572 to Holtyre. This is an alternate route to Kelore mine (page 118) and Ross mine (page 117).
km	15.7	Junction, road leading north to Burton-Munro occurrence and Munro mine (page 126).
km	16.7	Junction, road leading north to White-Guyatt mine (page 127), Gold Pyramid mine (page 127), and Croesus mine (page 128).
km	25.4	Junction, road leading north to Centre Hill (Potter) mine (page 130), Potterdoal mine (page 130), and Hedman mine (page 131).
km	33.8	Junction, road leading south to Buffonta mine (page 132).
km	37.6	Junction, road leading south to Buffonta mine (page 132).
km	38.6	Junction, road leading north to Bird mine (page 132).
km	41.9	Junction, road leading south to Garrcon mine (page 133).
km	56.6	Junction, trail leading north to Teddy Bear mine (page 133).
km	57.6	Junction, road leading south to Holt-McDermott mine (page 134).
km	61.2	Junction, road leading north to East Zone mine (page 134).

Argyll (Maude Lake) mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, SPHALERITE, GALENA, CHALCOPYRITE

In basalt

Fine particles of native gold occurred with pyrite in quartz-calcite veins. Arsenopyrite, pyrrhotite, sphalerite, galena, and chalcopyrite are associated with pyrite. Tellurides have been reported.

The gold mineralization was discovered in 1915 by prospector W.H.G. Parsons. In 1917-1918, Hill Gold Mining Company Limited sank a shaft to 38 m and produced 933 g of gold. In 1919-1920, Premier Gold Mining and Exploration Company Limited deepened the shaft to 61 m. Maude Lake Gold Mines Incorporated has held the property since 1981. The company reexamined the original workings and did surface and underground exploration on a gold-bearing zone 330 m southeast of the original shaft. The openings consist of trenches, an open pit, and a decline 833 m long.

The mine is about 14 km northeast of Matheson. See Map 12, No. 1, on page 119.

Road log from Highway 101 at **km 4.2** (see road log for Highway 101 East on page 122):

km	0	Junction; proceed north.
	4.4	Junction; turn right (east).
	6.0	Junction; turn left (north).
	10.0	Argyll mine.

Refs.: 6a p. 117-128; 51 p. 47; 102 p. 59; 124b p. 267; 168e p. 25-26.

Maps (T): 42 A/9 Matheson
(G): 1947-2 Township of Beatty, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 266 Beatty Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Blue Quartz mine

NATIVE GOLD, PYRITE, PYRRHOTITE, GALENA. SPHALERITE, CHALCOPYRITE, EPIDOTE

In quartz-calcite veins in basalt

Native gold occurred with pyrite in bluish quartz. Pyrrhotite, galena, sphalerite, and chalcopyrite are associated with pyrite. Tellurides have been reported. Epidote and chlorite occur with calcite in the veins.

Gold was discovered near Painkiller Lake in 1907-1908. In 1912, Cartwright Goldfields Limited began development of a vein carrying visible gold that was found on the south shore of Painkiller Lake. The company sank a 30 m shaft and erected buildings on the site. Fires in 1913 and in 1916 destroyed the mine buildings and a 10-stamp mill. Blue Quartz Gold Mines Limited continued developing the deposit between 1921 and 1928; the underground workings consisted of a shaft sunk to a depth of 157 m and two winzes reaching depths of 152 m and 233 m respectively. Some gold was produced. There was further gold production in 1933-1934 when Amalgamated Gold Fields Corporation worked the deposit. Total production from the deposit is estimated to be 2519.3 g of gold and 1026.4 g of silver.

The mine is on the south side of Painkiller Lake, about 16 km from Matheson. See Map 12, No. 4, on page 119.

Road log from Highway 101 at **km 4.2** (see road log for Highway 101 East on page 122):

km	0	Junction Highway 101 and the road leading to Painkiller Lake; proceed north to Painkiller Lake.
	4.5	Junction; turn right (east).
	7.7	Junction; turn left (north).
	10.9	Junction; turn right (east).
	11.9	Blue Quartz mine.

Refs.: 6a p. 166-182; 51 p. 48; 102 p. 58; 168e p. 23-25.

Maps (T): 42 A/9 Matheson
(G): 1947-2 Township of Beatty, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 266 Beatty Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Lucky Ben mine

NATIVE GOLD, PYRITE, PYRRHOTITE, ARSENOPYRITE, CHALCOPYRITE, GALENA, SPHALERITE, WEHRLITE

In quartz-calcite veins in basalt

Much visible gold was found with tellurides, pyrite, and pyrrhotite in quartz during early exploration of the deposit. A telluride, wehrlite, was identified from the deposit. Other minerals occurring in the quartz veins are arsenopyrite, chalcopyrite, galena, and sphalerite.

The deposit was originally explored by two pits and a shaft (9.75 m deep) prior to 1918. In 1923, Lucky Ben Gold Mines Limited did some surface trenching and deepened the shaft to 12 m. The next period of development was in 1975-1976 when Lynco Mining Development Incorporated put up a surface plant, deepened the shaft to 14 m, and did some trenching. A small amount of gold was produced.

The mine is west of Painkiller Lake, about 16 km from Matheson. See Map 12, No. 2, on page 119.

Road log from Highway 101 at **km 4.2** (see road log for Highway 101 East on page 122):

km	0	Junction, Highway 101 and the road leading to Painkiller Lake; proceed north toward Painkiller Lake.
	4.5	Junction; turn right (east).
	7.7	Junction; turn left (north).
	10.9	Turnoff to Blue Quartz mine; continue straight ahead.
	11.7	Lucky Ben mine on left.

Refs.: 6a p. 146-156; 51 p. 123; 102 p. 60-61; 168e p. 29.

Maps (T): 42 A/9 Matheson
(G): 1947-2 Township of Beatty, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 266 Beatty Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Aljo mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE, ARSENOPYRITE, SPHALERITE, BISMUTHINITE

In quartz veins in basalt

Native gold occurred with pyrite and quartz. Associated minerals included pyrrhotite, chalcopyrite, arsenopyrite, and sphalerite. Bismuthinite and bismuth tellurides have been reported.

Painkiller Lake Gold Mines Company Limited staked the first claim in 1907. In 1916, the company sank a shaft to 27 m (South shaft), and Hattie Gold Mining Company Limited sank shafts to 9 m (North shaft) and 15 m (prospect shaft) on adjoining claims. The North and South shafts are about 420 m apart. In 1922-1924, Hattie Gold Mines Limited took over both properties, deepening the North shaft to 137 m and the South shaft to 61 m. Between 1937 and 1940, Devon Gold Mines Limited extended the underground workings in the South shaft to 198 m and produced 1306.3 g of gold and 155.5 g of silver.

The mine is just north of Painkiller Lake, about 18 km from Matheson. See Map 12, No. 3, on page 119.

Road log from Highway 101 at **km 4.2** (see road log for Highway 101 East on page 122):

km	0	Junction, Highway 101 and the road leading to Painkiller Lake; proceed north toward Painkiller Lake.
	4.5	Junction; turn right (east).
	7.7	Junction; turn left (north).
	10.9	Turnoff to Blue Quartz mine; continue straight ahead.
	11.7	Lucky Ben mine; continue straight ahead.
	14.2	Aljo mine.

Refs.: 6a p. 103-117; 51 p. 45-47; 102 p. 58-61; 168e p. 20-23.

Maps (T): 42 A/9 Matheson
(G): 1947-2 Township of Beatty, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 266 Beatty Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Stewart-Abate mine

NATIVE GOLD, PYRITE, MOLYBDENITE, PYRRHOTITE, CHALCOPYRITE, TOURMALINE

In quartz-dolomite veins in diorite

Visible gold was found with pyrite and molybdenite in quartz veins during early exploration of the deposit. Pyrrhotite, chalcopyrite, and black tourmaline have also been reported.

George Abate originally staked the deposit in 1913. In 1914, the Hudson Bay Mining Company dug pits and trenches. In 1915, Munro Consolidated Gold Mines Limited sank a shaft to 32 m and between 1927 and 1941, Stewart-Abate Gold Mines Limited deepened the shaft to 37 m and did underground sampling.

The deposit is north of Highway 101 at a point 12.8 km east of the junction of highways 101 and 11 in Matheson (see road log for Highway 101 East on page 122); at this point, a trail 1200 m long leads north to the mine. See Map 12, No. 5, on page 119.

Refs.: 6a p. 156-166; 51 p. 49; 102 p. 54; 168e p. 30-31.

Maps (T): 42 A/9 Matheson
(G): 1947-2 Township of Beatty, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 266 Beatty Township, Distrcit of Cochrane (Ontario Geological Survey, 1:31 680)

Munro mine

CHRYSOTILE, SERPENTINE, PICROLITE, MAGNETITE, CALCITE, CLINOZOISITE, AMPHIBOLE, EPIDOTE, ORTHOCLASE, CHLORITE, PYRITE, CHALCOPYRITE

In mafic to ultramafic rocks

Yellowish-green chrysotile asbestos (cross-fibre) was formerly mined from this deposit. It occurs in veins up to 2 cm wide in fractures in light to medium and dark green massive serpentine. Light green picrolite is also present. Magnetite is common in serpentine as disseminated grains and granular masses. White calcite occurs in massive, columnar, platy, and granular forms; it fluoresces pink when exposed to ultraviolet rays. Radiating prismatic aggregates of light greyish-green to brownish-green clinozoisite occurs in white massive quartz that contains layers of dark green chlorite. Amphibole was noted as silky white hair-like aggregates and as greenish-grey curved foliated masses, the latter containing microscopic crystals of yellowish-green epidote. Pink orthoclase is associated with quartz. Pyrite and chalcopyrite were also identified in specimens found in the dumps.

This occurrence was first reported in 1915 by P.E. Hopkins, Ontario Bureau of Mines. It was brought to the attention of Canadian Johns-Manville Company Limited in 1948 by Alex Heffren of Swastika, a former employee at the company's Jeffrey Mine in Asbestos, Quebec. The company examined the deposit, acquired the claims, and undertook development in 1949. Production was obtained from an open pit from 1950 to 1959, and from shafts at depths of 367 m and 289 m from 1954 to 1964. A mill operated at the site.

The mine is about 18 km east of Matheson. See Map 12, No. 6, on page 119.

Road log from Highway 101 at **km 15.7** (see road log for Highway 101 East on page 122):

km	0	Junction, Highway 101 and Munro mine road; proceed onto Munro Mine road.
	0.85	Trail on right leading 250 m to the *Burton-Munro occurrence*. This prospect was explored by a shaft sunk by Burton-Munro Mines Limited between 1916 and 1919. Pyrite and arsenopyrite occurred in quartz-dolomite veins in basalt. See Map 12, No. 7, on page 119.
	2.2	Munro mine.

Refs.: 6a 238-255, 317-332; 84 p. 176; 168c p. 2, 36-37; 211 p. 40.

Maps (T): 42 A/9 Matheson
(G): 1951-5 Township of Munro, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 361 Munro Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

White-Guyatt mine

NATIVE GOLD, PYRITE, PYRRHOTITE, GALENA, SPHALERITE

In quartz-dolomite veins in greywacke and argillite

Visible gold occurred in quartz veins. Coarse gold was found during surface exploration of a vein in the 1940s. Gold-bearing quartz veins carried some pyrite, pyrrhotite, galena, and sphalerite.

The veins were explored by shafts and trenches. Between 1908 and 1910, Munro Mines Limited sank the West (Guelph) shaft to 28 m, and between 1911 and 1915, Detroit New Ontario Mines Limited sank the East shaft to 61 m. These shafts are 435 m apart. Subsequent exploration work was done by White-Guyatt Mining Company Limited (1936-1937, 1946, 1987) and Wright-Hargreaves Mines Limited (1940-1941). Recorded gold production totalled 311 g valued at $200; it was obtained in 1911. A small stamp mill operated on the site.

The mine is about 16 km east of Matheson. See Map 12, No. 9, on page 119.

Road log from Highway 101 at **km 16.7** (see road log for Highway 101 East on page 122):

km	0	Junction, Highway 101 and a mine road leading north; proceed north along the mine road.
	0.15	*Gold Pyramid mine* on right. About 1120 g of gold were produced in 1911 by Gold Pyramid Mining Company of Larder Lake Limited. The gold-bearing quartz veins carried pyrite, chalcopyrite, and galena. Openings consisted of shallow shafts and trenches; a 5-stamp mill operated on the site. See Map 12, No. 8, on page 119.
	0.45	Trail on right leads east 440 m to the White-Guyatt East shaft.
	0.5	White-Guyatt West shaft on right.

Refs.: 6a p. 368-379, 913-921; 51 p. 70, 81-82; 102 p. 54; 148 p. 45-46; 168c p. 53-56.

Maps (T): 42 A/9 Matheson

(G): 1951-5 Township of Munro, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)

1951-6 Township of Guibord, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)

2205 Timmins-Kirkland Lake Sheet, Cochrane, Sudbury and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 361 Munro Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

GDIF 399 Guibord Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Croesus mine

NATIVE GOLD, PYRITE, ARSENOPYRITE

In quartz vein cutting diabase and lava

When the gold-bearing quartz outcrop on this property was discovered, it was so spectacularly rich that the owners bolted down the entire surface with sheets of solid steel 12 mm thick to protect it from high-graders. Specimens of coarse, dark yellow native gold in white quartz obtained from the vein were regarded as the richest gold-bearing quartz specimens found anywhere in the world. A rich pocket was encountered while sinking the first 18 m of the shaft, and it produced 70 728 g of gold valued at $47,000 from 346.5 kg of quartz, the price of gold at that time being $20.67 per ounce. Some of these very rich specimens were purchased by the Ontario Bureau of Mines for exhibition purposes; five specimens weighing a total of 38.5 kg contained 14 951.2 g of gold and were valued at $10,000. A coloured photograph of one of the gold-quartz specimens that appears in the frontispiece of the 26th Annual Report of the Ontario Bureau of Mines has been described as follows: "Lumps of pure gold studded the quartz like raisins in a Christmas pudding; not merely here and there, but evenly distributed through the mass and, as nearly as one could judge, taking up more than one-third of the whole" (Ref.: 224 p. 516). By the time the shaft reached a depth of 33.5 m, gold valued at $150,000 had been recovered.

Plate 25

Croesus mine, 1916. (Courtesy of Ontario Archives Acc. 6450 S8625)

An egg-shaped nugget 5 cm by 3 cm was found during early mining operations, and coarse, sheet-like concentrations of gold have been reported. Pyrite, needle-like crystals of arsenopyrite, and tellurides were associated with the gold. The gold-bearing vein was 61 m long and a few centimetres to a few metres wide.

Although numerous gold claims were staked in Munro Township in 1907 by prospectors who had just made gold discoveries in the Abitibi district, no promising veins were located, and the township was soon discredited. Interest was revived following gold discoveries in the Porcupine district in 1909. When prospecting was resumed, a remarkably rich gold showing was found in the spring of 1914 by a prospector named Welsh. Although he had staked a claim, a survey later established that the rich vein was found in the adjoining Dobie-Leyson claim, only 4.5 m from the Welsh boundary. The two claims were acquired by the Dominion Reduction Company Limited of Cobalt, and Croesus Gold Mines Limited was incorporated in 1915 to work the deposit. Mining operations were conducted from 1915 to 1918 but were interrupted in 1916 when the great fire of 1916 swept the area and destroyed the camp and mine buildings. A shaft 122 m deep was used to hoist the ore. Between 1932 and 1935, Munro-Croesus Mines Limited obtained a small production from mine dumps and from ore mined from old underground workings. Total production amounted to 462 159.5 g of gold and 44 260 g of silver.

The mine is about 700 m east of Croesus Lake, 18.7 km east of Matheson. See Map 12, No. 10, on page 119.

Road log from Highway 101 at **km 16.7** (see road log for Highway 101 East on page 122):

km	0	Junction, Highway 101 and mine road leading north; proceed north along the mine road.
	0.15	Gold Pyramid mine on right; continue straight ahead.
	0.45	Trail on right to the White-Guyatt East shaft; continue straight ahead.
	0.5	White-Guyatt West shaft on right; continue straight ahead.
	1.95	Croesus mine. The mine may also be reached by following a trail 825 m long leading south from the southeastern end of the Munro mine (see page 126).

Refs.: 6a p. 278-292; 37 p. 61-62; 51 p. 81; 84 p. 181-182; 102 p. 1, 53-54, 55-56; 124b p. 267; 168c p. 2, 48-51; 183 p. 81; 184 p. 93, 94; 223 p. 575; 224 p. 516.

Maps (T): 42 A/9 Matheson

(G): 1951-5 Township of Munro, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 361 Munro Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Centre Hill (Potter) mine

CHALCOPYRITE, PYRRHOTITE, SPHALERITE, PYRITE, NATIVE SILVER, SIDEROTIL, BROCHANTITE

In volcanic rocks

Sulphide minerals occur as intimate mixtures forming masses in the rock. Native silver has been reported. Siderotil occurs as a white coating on rusty-weathering specimens in the dumps. Green brochantite occurs with white calcite crusts on ore-bearing rock found in the dumps.

The mine, a former copper producer, was initially worked from a shaft 296 m deep. Centre Hill Mines Limited, later (1965) renamed Munro Copper Mines Limited, commenced development in 1952. A mill was erected on the site and concentrates were shipped in 1967-1968. Harrison Drilling and Exploration Company Limited operated the mine and mill from 1968 to 1972. The shaft was deepened to 388 m in 1970.

The mine is 34.7 km northeast of Matheson. See Map 12, No. 11, on page 119.

Road log from Highway 101 at **km 25.4** (see road log Highway 101 East on page 122):

km	0	Junction, Highway 101 and road leading north; proceed north.
	8.3	Junction; turn left.
	9.3	Centre Hill (Potter) mine.

Refs.: 6a p. 266-278; 120 p. 118; 172 p. 124-125.

Maps (T): 42 A/9 Matheson

(G): 1951-5 Township of Munro, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 361 Munro Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Potterdoal mine

CHALCOPYRITE, SPHALERITE, PYRRHOTITE

At the contact of mafic and ultramafic rocks

The ore mineral, chalcopyrite, occurred as granular masses with sphalerite and pyrrhotite. These minerals formed a lens at the contact of andesitic and peridotitic rocks.

The deposit was discovered in 1926 by Paul E. Doal of Matheson. The mine was operated from 1927 to 1930 by Potterdoal Mines Limited. Ore was shipped to the smelter in Noranda. Production amounted to 2131.5 g of gold, 20 496.9 g of silver, and 14 479.7 kg of copper. The workings consist of two shafts sunk to 38 m and 61 m respectively.

The mine is north of the Centre Hill mine. See Map 12, No. 12, on page 119.

Road log from Highway 101 at **km 25.4** (see road log for Highway 101 East on page 122):

km	0	Junction, Highway 101 and a road leading north; proceed north.
	8.3	Junction, road to Centre Hill mine; continue straight ahead.

km 9.6 Junction, mine road; turn left.

11.2 Potterdoal mine.

Refs.: 6a p. 336-345; 169c p. 42-43; 172 p. 126.

Maps (T): 42 A/9 Matheson

(G): 1951-5 Township of Munro, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 361 Munro Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Hedman mine

SERPENTINE, CHRYSOTILE, MAGNETITE, CHLORITE, MICA, CALCITE

In serpentinized peridotite

Massive dark green serpentine contains veinlets of light green chrysotile asbestos. Asbestos fibres measure up to 3 mm long. Magnetite, chlorite, light brown mica, and white calcite occur in the serpentine. Sulphide minerals have been reported. The serpentine weathers to chalky white. Hedman Mines Limited (renamed Hedman Resources Limited in 1984) began developing the deposit in 1956. An open pit has been in operation since 1962 when production of asbestos fibre began. The ore is processed at the company mill in Matheson. Since 1984, serpentine ore has been processed to produce 'hedmanite', which is composed of 86 per cent massive serpentine and 14 per cent chrysotile; this product is used in the manufacture of heat resistant plastics, brake pads, brake shoes, adhesives, paints, and paper.

The mine is north of the Centre Hill and Potterdoal mines. See Map 12, No. 13, on page 119.

Road log from Highway 101 at **km 25.4** (see road log for Highway 101 East on page 122):

km 0 Junction, Highway 101 and road leading north; proceed north.

8.3 Junction, road to Centre Hill mine; continue straight ahead.

9.6 Junction, road to Potterdoal mine; continue straight ahead.

11.7 Hedman mine.

Refs.: 6a p. 1265-1278; 124a p. 278; 168c p. 41; 211 p. 50-51; 251 p. 148-149.

Maps (T): 42 A/9 Matheson

(G): 1951-5 Township of Munro, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 361 Munro Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Buffonta mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, ARGENTITE

In quartz veins in basalt

Visible gold was associated with pyrite in quartz-albite veins. Pyrite occurred as cubes up to 12 mm across. Chalcopyrite, galena, and argentite have also been reported. Kimberlite dykes were recently found in the gold-bearing structures.

Gold was discovered by Digby Grimston in 1919. Gold was found in oxidized material in the area that later became the open pit. Open pit mining was carried out by Amca Mines Limited from 1936 to 1937. A mill operated on the site and production amounted to 1150.8 g of gold and 124.4 g of silver, valued at $1300. Since then, several companies, including Buffonta Mines Limited (1939-1941), have explored the deposit. Further gold production was obtained from the open pit by Thorncliffe Mines Limited in 1962 (6220 g), by Kerr Addison Mines Limited in 1981-1982 (279 927 g) and by Deak Resources Corporation-Perrex Resources Incorporated joint venture in 1990-1991 (90 260.9 g).

The mine is south of Highway 101, 46.4 km east of Matheson. See Map 12, No. 14, on page 119.

Road log from Highway 101 at **km 33.8** (see road log for Highway 101 East on page 122):

km	0	Junction, Highway 101 and a road leading south; proceed south.
	5.0	Junction; continue straight ahead (east).
	9.4	Junction; turn left (east).
	12.6	Buffonta mine. An alternate route is via a road leading south from Highway 101 at **km 37.6** (see road log on page 122). The distance from the highway is 4.8 km.

Refs.: 5a p. A-6; 6a p. 727-743; 51 p. 68; 124b p. 262-263; 168a p. 20-22.

Maps (T): 32 D/12 Lightning River
(G): 1949-1 Township of Garrison, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 360 Garrison Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Bird mine

CHRYSOTILE, MAGNESITE, BRUCITE, MAGNETITE, CHROMITE

In serpentinite

Chrysotile asbestos veins occur in serpentinite. Minor accessory minerals occurring in serpentinite include magnesite, brucite, magnetite, and chromite.

The asbestos deposit was originally staked by S.J. Bird in 1950. Between 1968 and 1970, Canadian Johns-Manville Company Limited explored the deposit by sinking a shaft to a depth of 95 m. There is a small open pit near the shaft.

The mine is on the north side of Highway 101, 41.3 km east of Matheson. See Map 12, No. 15, on page 119.

Road log from Highway 101 at **km 38.7** (see road log for Highway 101 East on page 122):

km	0	Junction; Highway 101 and a road leading north; proceed north.
	1.3	Junction; follow the road on right.
	2.7	Bird mine.

Refs.: 6a p. 708-713; 211 p. 44.

Maps (T): 32 D/12 Lightning River
(G): 1949-1 Township of Garrison, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 360 Garrison Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Garrcon mine

NATIVE GOLD, PYRITE

In quartz veins in greywacke and argillite

Visible gold and pyrite are reported to occur in white quartz.

Surface and underground exploration was done by Garrcon Mines Limited between 1935 and 1937 and by Consolidated Mining and Smelting Company of Canada Limited in 1935 and 1941. The work involved sinking a shaft to 79 m and digging several trenches.

The mine is 43.5 km east of Matheson. Access is by a road leading south for 1.6 km from **km 41.9** on Highway 101 (see road log for Highway 101 East on page 122). See Map 12, No. 16, on page 119.

Refs.: 6a p. 766-777; 51 p.69; 168a p. 23-24.

Maps (T): 32 D/12 Lightning River
(G): 1949-1 Township of Garrison, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 360 Garrison Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Teddy Bear mine

NATIVE GOLD, PYRITE, TOURMALINE, MICA

In altered basalt

Gold was originally found in this deposit by panning the oxidized surface material. During early exploration of the deposit, rich specimens of coarse native gold are reported to have been obtained from quartz veins. Pyrite occurred as small crystals in the veins and in the host volcanic rock. Tourmaline and green mica are also reported.

The vein carrying rich native gold was discovered and staked in 1922 by William S. Seagers. Abitibi Mines Limited explored the deposit between 1923 and 1925 using several trenches and shafts sunk to 10.7 m (shaft No. 1) and 11.3 m (shaft No. 2). Between 1926 and 1947, Teddy Bear Valley Mines Limited continued exploration and deepened shaft No. 2 to 91.5 m.

The mine is 57 km east of Matheson. A trail 0.4 km long leads north to the mine from Highway 101 at **km 56.6** (see road log for Highway 101 East on page 122). See Map 12, No. 17, on page 119.

Refs.: 6a p. 535-544; 51 p. 77-78; 103b p. 45-46; 168d p. 33-36.

Maps (T): 32 D/12 Lightning River
(G): 1953-4 North part of the Township of Holloway, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 272 Holloway Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

Holt-McDermott mine

NATIVE GOLD, PYRITE, MAGNETITE, CHALCOPYRITE, PYRRHOTITE

In breccia

Native gold occurs as microscopic grains associated with pyrite. Magnetite, chalcopyrite, and pyrrhotite are intimately associated with pyrite.

Gold was discovered on the property in 1922 by P.A. McDermott. Trenching by McDermott Gold Mines Limited in 1923-1924 exposed gold-pyrite mineralization in silicified lava. Various companies have examined the property since then. American Barrick Resources began production in 1988 . The mine is serviced by a 620 m shaft. Production from 1988 to 1992, amounted to 7 882 091 g of gold.

The mine is 58.4 km east of Matheson. Access is via a road, 0.8 km long, leading south from Highway 101 at **km 57.6** (see road log for Highway 101 East on page 122). See Map 12, No. 18, on page 119.

Refs.: 6a p. 412-487; 124a p. 276; 124b p. 261-267; 168d p.29-30; 213b p. 184-190; 258 p. 38-39.

Maps (T): 32 D/12 Lightning River
(G): 1953-4 North part of the Township of Holloway, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 272 Holloway Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

East Zone mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, GALENA, SPHALERITE, CHALCOPYRITE, TETRAHEDRITE, FUCHSITE

In breccia

Visible gold occurs in quartz-carbonate veins in brecciated rock. Arsenopyrite, galena, sphalerite, chalcopyrite, and tetrahedrite are metallic minerals associated with gold mineralization. Fuchsite occurs in breccia host rock.

Underground development of the deposit was undertaken by Canamax Resources Incorporated in 1987. Production in 1988 amounted to 167 676.3 g of gold. Mining was conducted via a decline (ramp) to 110 m below the surface. Operations were discontinued in 1988.

The mine is 61.7 km east of Matheson. Access is by a road, 0.5 km long, leading north from Highway 101 at **km 61.2** (see road log for Highway 101 East on page 122). See Map 12, No. 19, on page 119.

Refs.: 6a p. 1302-1309; 124a p. 267.

Maps (T): 32 D/12 Lightning River

(G): 1953-4 North part of the Township of Holloway, district of Cochrane, Ontario (Ontario Geological Survey, 1:12 000)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 272 Holloway Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

MATHESON TO TIMMINS

Timmins (Porcupine) area

The Porcupine camp, once one of the great gold-producing areas in the world, became the province's leading gold producer within two years after it came into production in 1910; it maintained its dominant position until the Hemlo mines came into production in the 1980s. Its yield for 1913 nearly equalled the entire production (to 1912) from all Ontario mines from the time gold production was first obtained in 1866 from the Madoc area. In 1914, the Porcupine camp consisted of eight producing mines and became the leading gold-producing area in Canada, surpassing British Columbia and the Yukon, the previous front runners. Production peaked in 1941 with close to 46 655 000 g of gold. To the end of 1969, the Porcupine camp yielded a total of 1 633 979 371 g of gold, a production surpassed only by the Witwatersrand mines in South Africa.

Outcrops of spectacularly rich gold-bearing quartz were discovered by prospectors in the Porcupine Lake area in 1909. News of the discoveries sparked the greatest gold rush in the province since the wild staking that had taken place 15 years earlier in the Lake of the Woods gold fields. The discovery of the promising new gold field came at a time when Ontario recorded its lowest gold production since 1894, when the Cobalt silver camp was already established and the Elk Lake-Gowganda area had been thoroughly prospected, and when the optimistic hopes accompanying the early (1906) Larder Lake gold discoveries proved to be dishearteningly disappointing with the realization that most of the properties, having been indiscriminately staked, became the victims of wildcat promotional schemes discrediting the district for many years.

Although the occurrence of promising auriferous quartz veins in the Porcupine area had been reported by Ontario Bureau of Mines geologists E.M. Burwash in 1896 and W.A. Parks in 1899, prospectors who had obtained mining licenses prior to 1909 abandoned their work due to low

values obtained from the quartz veins. Visible gold was, however, found in quartz and schist on the east shore of Porcupine Lake in 1908 by H.F. Hunter, and in Whitney Township in June 1909 by George Bannerman. The most spectacular of the early discoveries was made by John S. Wilson of Massey Station in the fall of 1909 on a property that became the Dome mine; the sensational showing of native gold occurred in a dome-like outcrop of quartz that, in places, was over 30 m wide. Similarly rich showings discovered a short time later by Benjamin Hollinger, Alexander McIntyre, and John Miller developed into the Hollinger, McIntyre, and Acme (later part of the Hollinger) mines. Because of these rich finds, the district drew a stampede of experienced prospectors from other mining areas and the camp was heralded as another Cobalt. Within a few weeks, the immediate area was claimed and staking continued through the winter. By the end of 1910, most of the discoveries that later reached the production stage had been made. Those that became the greatest producers were among the earliest discoveries.

Development rapidly followed the discoveries. Initial shaft sinking commenced in the winter of 1909-1910 under less than ideal conditions. Supplies and equipment were rushed in via winter roads from the nearest railway centre at Kelso; until the railway was built in 1911, the summer route was an arduous combination of clay-bed roads and waterways by way of Frederick House River, Night Hawk Lake, and Porcupine Lake. Initial communication between Matheson and Porcupine was established by a telephone line strung on trees, and a twice weekly mail service was established. By the summer of 1910, 500 men were employed in the mines. The town of South Porcupine, Timmins, and Schumacher quickly sprang into existence as a result of the mining boom, which suffered a severe setback in July 1911 when a disastrous fire destroyed the mills of the Dome mine and the Hollinger mine, wiped out the town of South Porcupine and parts of the surrounding area, and took 71 lives.

Gold-bearing quartz veins occur in Archean volcanics and sediments intruded by various types of porphyries. Carbonate (calcite or dolomite) veins also carry native gold. Pyrite, as crystals and in massive form, and minor amounts of chalcopyrite, pyrite, galena, and pyrrhotite are commonly associated with the deposits.

The Timmins area was the scene of a prospecting rush in 1964 following the disclosure of a discovery by Texas Gulf Sulphur of a colossal zinc-copper-silver orebody that later became the Kidd Creek mine, Canada's largest producer of silver and zinc. The region also contains deposits of copper, copper-zinc, nickel, asbestos, and magnesite, some of which were exploited many years ago and are no longer accessible.

Tours of the surface plants of operating mines may be arranged during the summer months through the Timmins Chamber of Commerce.

Refs.: 14 p. 57-62; 17 p. 6-9, 22-24; 20 p. 3; 31 p. 361-366; 62 p. 9-10; 64 p. 6; 65 p. 8; 69 p. 561-562; 70 p. 306-308; 73 p. 53-56; 80 p. 1, 5; 88 p. 811-812; 115 p. 5-7; 206 p. 92-108; 219 p. 34; 233 p. 5, 100, 101-102.

Maps (T): 42 A Timmins

(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

IMPORTANT NOTE CONCERNING THE FOLLOWING PAGES

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Mines along Highway 101 West

Occurrences from Matheson to Timmins are described in the text following the road log.

km	0	Matheson, junction of highways 11 and 101/11; the road log proceeds west along Highway 101/11.
km	1.9	[illegible] porphyry is exposed in roadcuts on right. The porphyry is composed of a dark grey matrix enclosing rectangular and rounded fragments (about 2 cm across) of partly altered light olive-green feldspar. The rock takes a good polish and may be used as an ornamental stone.
km	6.2	Junction, Highway 11 leaves Highway 101 and leads north. The road log continues along Highway 101 West.

Porphyry Zone mine

NATIVE GOLD, PYRITE, GRAPHITE, MOLYBDENITE, FUCHSITE

In porphyry

Visible gold has been reported in pyrite and in graphite-molybdenite filling fractures in cherty porphyry. Fuchsite-bearing carbonate rock is associated with the porphyry.

The deposit was explored by St. Andrew Goldfields Limited from 1986 to 1989. Underground exploration involved diamond drilling and sinking of a shaft to 172 m.

The mine is about 10 km northwest of Matheson.

Road log from km 6.2 on Highway 101/11 west of Matheson:

km	0	Junction of highways 11 and 101 (Highway 11 leaves Highway 101 and leads north); proceed north along Highway 11.
	4.3	Junction; turn left (west).
	6.1	Porphyry Zone mine on right (north) side of road, about 100 m from the road.

Refs.: 6a p. 1408-1413; 256 p. 404.

Maps (T): 42 A/10 Porquis Junction
(G): P39 Taylor Township (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 264 Taylor Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km	[illegible]	[illegible]

Mines along Highway 101 West

Occurrences from Matheson to Timmins are described in the text following the road log.

km	**0**	**Matheson, junction of highways 11 and 101/11; the road log proceeds west along Highway 101/11.**
km	**1.9**	**Matachewan diabase porphyry is exposed in roadcut on right. The porphyry is composed of a dark grey matrix enclosing rectangular and rounded fragments (about 2 cm across) of partly altered light olive-green feldspar. The rock takes a good polish and may be used as an ornamental stone.**
km	**6.2**	**Junction, Highway 11 leaves Highway 101 and leads north. The road log continues along Highway 101 West.**

Porphyry Zone mine

NATIVE GOLD, PYRITE, GRAPHITE, MOLYBDENITE, FUCHSITE

In porphyry

Visible gold has been reported in pyrite and in graphite-molybdenite filling fractures in cherty porphyry. Fuchsite-bearing carbonate rock is associated with the porphyry.

The deposit was explored by St. Andrew Goldfields Limited from 1986 to 1989. Underground exploration involved diamond drilling and sinking of a shaft to 172 m.

The mine is about 10 km northwest of Matheson.

Road log from km 6.2 on Highway 101/11 west of Matheson:

km	0	Junction of highways 11 and 101 (Highway 11 leaves Highway 101 and leads north); proceed north along Highway 11.
	4.3	Junction; turn left (west).
	6.1	Porphyry Zone mine on right (north) side of road, about 100 m from the road.

Refs.: 6a p. 1408-1413; 256 p. 404.

Maps (T): 42 A/10 Porquis Junction

(G): P39 Taylor Township (Ontario Geological Survey, 1:15 840)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 264 Taylor Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km	**15.2**	**Junction, Highway 101 and the road (on right) to Stock Township mine.**

Stock Township mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, MAGNETITE, ARSENOPYRITE, FUCHSITE

In quartz-carbonate veins in carbonatized ultramafic rocks

Gold occurs as visible grains in milky-white quartz and in pyrite. Chalcopyrite, magnetite, and arsenopyrite are also present in the deposit. Fuchsite occurs as a constituent of the carbonate-chlorite-talc altered ultramafic rock.

Original exploration of the deposit was done by Quebec Sturgeon River Mines Limited between 1972 and 1975. In 1983, St. Andrew Goldfields Limited acquired the property and resumed development of the orebody. Production began in 1989. The mine is serviced by a shaft and an internal decline to a depth of 305 m. Production to the end of 1991 amounted to 1 724 039 g of gold.

Access to the mine is by a road 1.5 km long leading north from Highway 101 at **km 15.2**.

Refs.: 6a p. 1122-1136; 116b p. 243; 150c p. 92-101; 257 p. 392; 258 p. 360; 259 p. 333.

Maps (T): 42 A/10 Porquis Junction
(G): P38 Stock Township, Ontario (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 403 Stock Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 24.6 Junction of Highway 101 and the road (on left) leading to Aquarius mine.

Aquarius mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, GALENA

In quartz-carbonate veins in carbonatized ultramafic rocks

Gold was associated with sulphide minerals; some native gold occurred as flecks in veins. Pyrite was found as crystals and as disseminations.

Aquarius Porcupine Gold Mines Limited developed the deposit between 1936 and 1946. Asarco Exploration Company of Canada Limited resumed development in 1980 and produced some gold in 1984 and in 1988-1989. Operations were from a shaft sunk to 175 m. Total gold production amounted to 843 420 g.

The mine is 39.5 km east of Timmins. Access is via a road leading south 2.5 km from Highway 101 at **km 24.6**.

Refs.: 110 p. 56-57; 116a p. 220; 116b p. 242.

Maps (T): 42 A/10 Porquis Junction
(G): 2222 Night Hawk Lake area, Cochrane district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km	**25.5**	**Junction of Highway 101 and Highway 67 to Kettle Lakes Provincial Park and to Alexo mine.**

Alexo (Kelso) mine

PYRRHOTITE, PENTLANDITE, HEAZLEWOODITE, PYRITE, CHALCOPYRITE, SERPENTINE, AMPHIBOLE, MAGNETITE, CHROMITE, HEXAHYDRITE, GOETHITE

In serpentinized peridotite at the contact of andesite

Pyrrhotite and pentlandite were the chief ore minerals at this former nickel-copper producer. Minor amounts of heazlewoodite, pyrite, and chalcopyrite were associated with these minerals forming disseminations and masses in dark green to almost black massive serpentine. Dark green picrolite, light green chrysotile asbestos, and light green to medium green radiating aggregates of amphibole (actinolite) were noted in specimens found in the rock dumps. Magnetite is common in the serpentine and has formed pseudomorphs after olivine. Chromite has been reported. Coatings of dull-white powdery hexahydrite and of rusty-brown goethite occur on weathered specimens in the dumps.

The deposit was discovered in 1908 by Alexander Kelso, an early pioneer in the district who prospected the area after reading the Provincial Surveyor's report in which magnetic disturbances were noted in the area. It was found beneath gossan containing greenish-white nickel bloom. Assays indicated high nickel values, and the deposit was regarded as the most significant nickel find in Ontario since the Sudbury discoveries 25 years earlier. Initial shipment of nickel ore was made in 1912 by E.F. Pullen. The Alexo Mining Company Limited was formed in 1913, and continued production until 1919. The ore was treated at the Mond Nickel Company

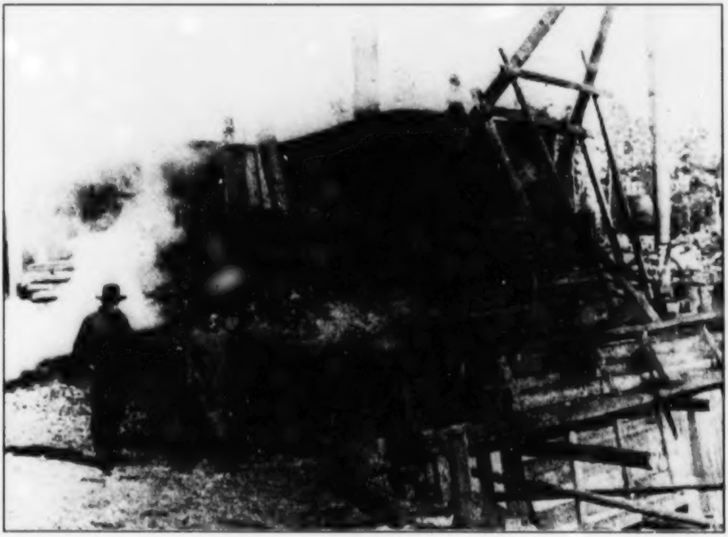


Plate 26

Alexo (Kelso) mine with discoverer Alex Kelso and Reverend Morrison, about 1915. (Courtesy of Ontario Archives Acc. 9160-S13698)

Stock Township mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, MAGNETITE, ARSENOPYRITE, FUCHSITE

In quartz-carbonate veins in carbonatized ultramafic rocks

Gold occurs as visible grains in milky-white quartz and in pyrite. Chalcopyrite, magnetite, and arsenopyrite are also present in the deposit. Fuchsite occurs as a constituent of the carbonate-chlorite-talc altered ultramafic rock.

Original exploration of the deposit was done by Quebec Sturgeon River Mines Limited between 1972 and 1975. In 1983, St. Andrew Goldfields Limited acquired the property and resumed development of the orebody. Production began in 1989. The mine is serviced by a shaft and an internal decline to a depth of 305 m. Production to the end of 1991 amounted to 1 724 039 g of gold.

Access to the mine is by a road 1.5 km long leading north from Highway 101 at **km 15.2**.

Refs.: 6a p. 1122-1136; 116b p. 243; 150c p. 92-101; 257 p. 392; 258 p. 360; 259 p. 333.

Maps (T): 42 A/10 Porquis Junction
(G): P38 Stock Township, Ontario (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 403 Stock Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 24.6 Junction of Highway 101 and the road (on left) leading to Aquarius mine.

Aquarius mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, GALENA

In quartz-carbonate veins in carbonatized ultramafic rocks

Gold was associated with sulphide minerals; some native gold occurred as flecks in veins. Pyrite was found as crystals and as disseminations.

Aquarius Porcupine Gold Mines Limited developed the deposit between 1936 and 1946. Asarco Exploration Company of Canada Limited resumed development in 1980 and produced some gold in 1984 and in 1988-1989. Operations were from a shaft sunk to 175 m. Total gold production amounted to 843 420 g.

The mine is 39.5 km east of Timmins. Access is via a road leading south 2.5 km from Highway 101 at **km 24.6**.

Refs.: 110 p. 56-57; 116a p. 220; 116b p. 242.

Maps (T): 42 A/10 Porquis Junction
(G): 2222 Night Hawk Lake area, Cochrane district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Alexo (Kelso) mine

PYRRHOTITE, PENTLANDITE, HEAZLEWOODITE, PYRITE, CHALCOPYRITE, SERPENTINE, AMPHIBOLE, MAGNETITE, CHROMITE, HEXAHYDRITE, GOETHITE

In serpentinized peridotite at the contact of andesite

Pyrrhotite and pentlandite were the chief ore minerals at this former nickel-copper producer. Minor amounts of heazlewoodite, pyrite, and chalcopyrite were associated with these minerals forming disseminations and masses in dark green to almost black massive serpentine. Dark green picrolite, light green chrysotile asbestos, and light green to medium green radiating aggregates of amphibole (actinolite) were noted in specimens found in the rock dumps. Magnetite is common in the serpentine and has formed pseudomorphs after olivine. Chromite has been reported. Coatings of dull-white powdery hexahydrite and of rusty-brown goethite occur on weathered specimens in the dumps.

The deposit was discovered in 1908 by Alexander Kelso, an early pioneer in the district who prospected the area after reading the Provincial Surveyor's report in which magnetic disturbances were noted in the area. It was found beneath gossan containing greenish-white nickel bloom. Assays indicated high nickel values, and the deposit was regarded as the most significant nickel find in Ontario since the Sudbury discoveries 25 years earlier. Initial shipment of nickel ore was made in 1912 by E.F. Pullen. The Alexo Mining Company Limited was formed in 1913, and continued production until 1919. The ore was treated at the Mond Nickel Company

Plate 26

Alexo (Kelso) mine with discoverer Alex Kelso and Reverend Morrison, about 1915. (Courtesy of Ontario Archives Acc. 9160-S13698)

smelter at Coniston; it assayed about 4.5 per cent nickel and 0.6 per cent copper. In 1943 and 1944, mining operations were reinstated by Harlin Nickel Mines Limited and some nickel and copper was produced.

The mine is 55 km northeast of Timmins; it consists of a shaft, 95 m deep, and some opencuts at the base of an andesite ridge. There is a small dump at the site.

Road log from Highway 101 at **km 25.5**:

km	0	Junction, highways 67 and 101; proceed north onto Highway 67.
	3.0	Turnoff (right) to Kettle Lakes Provincial Park.
		The numerous lakes in the park are kettle lakes – depressions in an outwash plain left by melting glaciers in Pleistocene time. The depressions range in size from potholes to lakes 1.5 km long and many have steep banks. They are characterized by clear greenish-blue waters. The outwash plain is composed of sand, gravel, and boulders and extends southward from Frederick House Lake to the east side of Night Hawk Lake; it overlies thick accumulations of varved clay deposited by Lake Ojibway-Barlow, which flooded the region between Lake Abitibi and Lake Timiskaming at the close of Pleistocene time. Frederick House Lake and Night Hawk Lake are remnants of that ancient lake.
	9.3	Junction, Highway 610; continue along Highway 67.
	17.85	Junction, single-lane road; turn right.
	18.8	Fork; bear right.
	19.0	Alexo mine.

Refs.: 4 p. 258-265; 64 p. 42; 106 p. 4, 16-19; 172 p. 116-117; 177 p. 222-223; 209 p. 34-38.

Maps (T): 42 A/10 Porquis Junction
(G): P308 Clergue Township, district of Cochrane (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)
GDIF 400 Clergue Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km 26.1 **Timiskaming conglomerate, quartzite, and arkose are exposed in *roadcut* on right. Conspicuous angular blotches of bright green mica occur with boulders and pebbles of rhyolite, tuff, feldspar porphyry, quartzite, chert, and quartz in a dark grey matrix. Serpentine pebbles have been reported in the conglomerate (Ref.: 123 p. 236).**

km 31.3 **Junction of Highway 101 and Highway 803 to Night Hawk Peninsular mine, Goldhawk mine, and Gold Island mine.**

smelter at Coniston; it assayed about 4.5 per cent nickel and 0.6 per cent copper. In 1943 and 1944, mining operations were reinstated by Harlin Nickel Mines Limited and some nickel and copper was produced.

The mine is 55 km northeast of Timmins; it consists of a shaft, 95 m deep, and some opencuts at the base of an andesite ridge. There is a small dump at the site.

Road log from Highway 101 at **km 25.5**:

km	0	Junction, highways 67 and 101; proceed north onto Highway 67.
	3.0	Turnoff (right) to Kettle Lakes Provincial Park.
		The numerous lakes in the park are kettle lakes – depressions in an outwash plain left by melting glaciers in Pleistocene time. The depressions range in size from potholes to lakes 1.5 km long and many have steep banks. They are characterized by clear greenish-blue waters. The outwash plain is composed of sand, gravel, and boulders and extends southward from Frederick House Lake to the east side of Night Hawk Lake; it overlies thick accumulations of varved clay deposited by Lake Ojibway-Barlow, which flooded the region between Lake Abitibi and Lake Timiskaming at the close of Pleistocene time. Frederick House Lake and Night Hawk Lake are remnants of that ancient lake.
	9.3	Junction, Highway 610; continue along Highway 67.
	17.85	Junction, single-lane road; turn right.
	18.8	Fork; bear right.
	19.0	Alexo mine.

Refs.: 4 p. 258-265; 64 p. 42; 106 p. 4, 16-19; 172 p. 116-117; 177 p. 222-223; 209 p. 34-38.

Maps (T): 42 A/10 Porquis Junction

(G): P308 Clergue Township, district of Cochrane (Ontario Geological Survey, 1:15 840)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

GDIF 400 Clergue Township, District of Cochrane (Ontario Geological Survey, 1:31 680)

km	[illegible]	Timiskaming conglomerate, greywacke, and arkose are exposed in roadcut on right. Conspicuous, angular blotches of bright green mica occur with boulders and pebbles of [illegible] tuff, feldspar porphyry, quartzite, chert, and quartz in a [illegible] matrix. Serpentine pebbles have been reported in the conglomerate (Ref.: 123 p. 230).
km	[illegible]	Junction of Highway 101 and Highway [illegible] to Night Hawk Peninsula mine, [illegible] mine, and Gold Island mine.

Night Hawk Peninsular mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, CHLORITE, FUCHSITE, TOURMALINE, BARITE, MOLYBDENITE, BISMUTH

In quartz veins in volcanic rocks

Much visible gold occurred in nearly transparent quartz stringers in carbonatized brecciated zones in volcanic rocks; pyrite, arsenopyrite, and chlorite were associated with the gold. Bright green mica (fuchsite) and black tourmaline were noted in quartz in the dumps. Barite, molybdenite, and native bismuth have been reported from the deposit.

The property was staked by Charles Auer in 1907 following the discovery of visible gold in quartz on Gold Island in the summer of that same year. Later, a quartz vein carrying visible gold was found on the shore of Night Hawk Lake after the lake had been lowered in 1909 by another prospector, the Reverend Father Paradis, to facilitate prospecting his claim. A shaft was put down on this vein in 1917 by Night Hawk Lake Mining Company Limited.

Production was obtained from 1924 to 1927 by Night Hawk Peninsular Mines Limited, and in 1940 and 1944 by Porcupine Peninsular Gold Mines Limited, for a total yield of 852 720 g of gold and 178 718 g of silver. The underground workings extend to a depth of 312.6 m.

The mine is on the shore of North Peninsula at the northern end of Night Hawk Lake.

Road log from Highway 101 at **km 31.3** (see page 140):

km	0	Junction, highways 101 and 803; proceed onto Highway 803.
	4.8	Junction, single-lane road to Gold Island; continue along the main road.
	6.7	End of the road at Night Hawk Peninsular mine.

Refs.: 51 p. 53-54; 86 p. 31-33; 102 p. 42-43; 110 p. 44-46; 219 p. 505; 220 p. 92-93.

Maps (T): 42 A/7 Watabeag River
(G): 2222 Night Hawk Lake area, Cochrane district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Goldhawk mine, Gold Island mine

NATIVE GOLD, PYRITE, FUCHSITE, TOURMALINE, AXINITE

In quartz and quartz-carbonate veins

Native gold occurred with cubes of pyrite in quartz veins cutting red aplite and carbonatized volcanic rocks at these two old mines. Green chrome mica (fuchsite) and black tourmaline occur in the dumps. Mauve to almost white axinite has been reported in quartz carbonate specimens in the old dump at the Goldhawk mine.

The Goldhawk deposit occurs on the eastern tip of the south end of the peninsula at the north end of Night Hawk Lake, while the Gold Island mine is on an adjacent island known as Gold Island. Visible gold in quartz was staked on Gold Island in 1907 by Victor Manson and Harry Benella; it is believed to be the first bona fide gold discovery in the Porcupine area and the first property to be worked. The owners sank a shaft to a depth of 15 m and erected a mill in 1907-1908. Hollinger Consolidated Gold Mines Limited put down a 55 m shaft to investigate the deposit in 1934-1935.

A total of 1648.5 g of gold was recovered from it in 1947 by Goldhawk Porcupine Mines Limited, which sank a new shaft to a depth of 195.5 m. Some ore was mined in 1980 from a small open pit by Pamour Porcupine Mines Limited.

The mines are 32 km east of Timmins. Access to the Goldhawk mine is by a single-lane road, 1.6 km long, that leaves Highway 803 at a point 4.8 km south of its junction with Highway 101 (see road log to Night Hawk Peninsular mine on page 141). The road ends at this mine, and Gold Island, where the Gold Island mine is located, is about 305 m to the northeast.

Refs.: 51 p. 51-52; 106 p. 20-21; 110 p. 41-42, 64; 219 p. 410; 221 p. 531.

Maps (T): 42 A/10 Porquis Junction
(G): 2222 Night Hawk Lake area, Cochrane district (Ontario Geological Survey, 1:31 680)

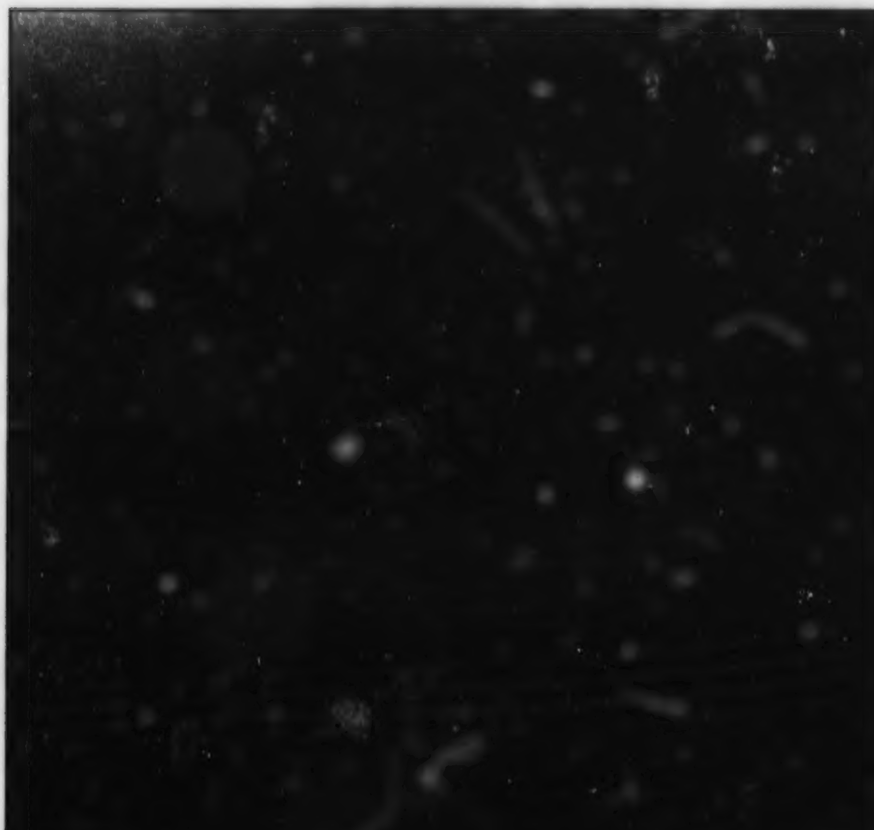


Plate 27

Timiskaming conglomerate in a roadcut on Highway 101 West at km 26.1. The dark angular pebbles are composed of bright green chrome mica. (GSC 161453A)

(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 38.8 Junction, highways 101 and 610.

km 39.5 Falconbridge Metallurgical Site on right.

km 40.5 Junction, road on right leading to Hoyle Pond mine and Owl Creek mine.

Hoyle Pond mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, TOURMALINE, SCHEELITE, CHLORITE, GRAPHITE

In quartz veins cutting carbonatized ultramafic rocks

Gold is associated with pyrite, chalcopyrite, and sphalerite in quartz-carbonate veins. Brown tourmaline, scheelite, and chlorite are also present. Graphite and flattened pyrite nodules occur in carbonaceous argillite. During exploration in 1985, one quartz vein was found to carry visible gold over most of its 380 m length.

The deposit was discovered beneath a tailings pond by Texasgulf Incorporated (renamed Kidd Creek Mines Limited in 1981) during a drilling program in 1969. Underground development began in 1983 and production, in 1985. The mine is serviced by a decline driven to 295 m below the surface. To the end of 1991, the mine produced 10 138 427 g of gold. The property belongs to Falconbridge Gold Corporation.

The mine is 3 km west of the Falconbridge Metallurgical Site (see Map 13, No. 11, on page 145). Access is by a road leading north from Highway 101 at **km 40.5**. See Map 13, No. 4, on page 145.

Refs.: 56a p.114-123; 116b p. 243, 245; 116d p. 239.

Maps (T): 42 A/11 Pamour

(G): 48n Bigwater Lake area, district of Cochrane, Ontario (Ontario Geological Survey, 1:63 360)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Owl Creek mine

NATIVE GOLD, PYRITE, GRAPHITE, SPHALERITE, MICA, CHLORITE

In quartz veins in basalt and greywacke

Gold is associated with pyrite, graphite, sphalerite, and green mica in quartz. Most gold occurs as fine inclusions in pyrite; visible gold is rare. Pyrite occurs as cubic crystals (to 1 cm across) in greywacke, as nodules (to 3 cm across), and as massive lenses in a graphitic zone between basalt and greywacke. Green mica and chlorite occur as alteration products in basalt.

Canadian Nickel Company Limited discovered gold mineralization on the property in 1966. Texasgulf Incorporated (renamed Kidd Creek Mines Limited in 1981) began underground development in 1979. Development consisted of a decline and an open pit. Production from 1981 to 1989 amounted to 6 956 839 g of gold. Operations were suspended in 1992. The property belongs to Falconbridge Gold Corporation.

(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km	**38.0**	**Junction, highways 101 and 610.**
km	**39.5**	**Falconbridge Metallurgical Site on right.**
km	**40.5**	**Junction, road on right leading to Hoyle Pond mine and Owl Creek mine.**

Hoyle Pond mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, TOURMALINE, SCHEELITE, CHLORITE, GRAPHITE

In quartz veins cutting carbonatized ultramafic rocks

Gold is associated with pyrite, chalcopyrite, and sphalerite in quartz-carbonate veins. Brown tourmaline, scheelite, and chlorite are also present. Graphite and flattened pyrite nodules occur in carbonaceous argillite. During exploration in 1985, one quartz vein was found to carry visible gold over most of its 380 m length.

The deposit was discovered beneath a tailings pond by Texasgulf Incorporated (renamed Kidd Creek Mines Limited in 1981) during a drilling program in 1969. Underground development began in 1983 and production, in 1985. The mine is serviced by a decline driven to 295 m below the surface. To the end of 1991, the mine produced 10 138 427 g of gold. The property belongs to Falconbridge Gold Corporation.

The mine is 3 km west of the Falconbridge Metallurgical Site (see Map 13, No. 11, on page 145). Access is by a road leading north from Highway 101 at **km 40.5**. See Map 13, No. 4, on page 145.

Refs.: 56a p.114-123; 116b p. 243, 245; 116d p. 239.

Maps (T): 42 A/11 Pamour

(G): 48n Bigwater Lake area, district of Cochrane, Ontario (Ontario Geological Survey, 1:63 360)

2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Owl Creek mine

NATIVE GOLD, PYRITE, GRAPHITE, SPHALERITE, MICA, CHLORITE

In quartz veins in basalt and greywacke

Gold is associated with pyrite, graphite, sphalerite, and green mica in quartz. Most gold occurs as fine inclusions in pyrite; visible gold is rare. Pyrite occurs as cubic crystals (to 1 cm across) in greywacke, as nodules (to 3 cm across), and as massive lenses in a graphitic zone between basalt and greywacke. Green mica and chlorite occur as alteration products in basalt.

Canadian Nickel Company Limited discovered gold mineralization on the property in 1966. Texasgulf Incorporated (renamed Kidd Creek Mines Limited in 1981) began underground development in 1979. Development consisted of a decline and an open pit. Production from 1981 to 1989 amounted to 6 956 839 g of gold. Operations were suspended in 1992. The property belongs to Falconbridge Gold Corporation.

The mine is 4.5 km west of the Falconbridge Metallurgical Site. See Map 13, No. 3, on page 145. Access is from Highway 101 at **km 40.5** (see road log on page 143).

Refs.: 32b p.34-36; 116d p.255; 259 p. 143.

Maps (T): 42 A/11 Pamour
(G): 48n Bigwater Lake area, district of Cochrane, Ontario (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 41.5 Junction, Highway 101 and a road (on left) leading south to Hoyle mine.

Hoyle mine

NATIVE GOLD, PYRRHOTITE, PYRITE, ARSENOPYRITE, GALENA, SPHALERITE

In quartz veins in conglomerate and greywacke

The gold-bearing veins contain pyrite and pyrrhotite with minor arsenopyrite, galena, and sphalerite. Gold occurs as grains in quartz and as minute particles in sulphide minerals.

The deposit was originally staked by Messrs Lang and Dipaolo. Hollinger Gold Mines Limited began exploration in 1935. The mine was brought to production in 1941-1943 by Hoyle Gold Mines Limited and work was continued in 1945-1948 by Hoyle Mining Company Limited. It was serviced by a shaft sunk to 549 m. In 1977-1978, Pamour Porcupine Mines Limited worked the deposit from a shaft and from an open pit located south of the shaft. Total gold production amounted to 2 234 533 g. The property belongs to Falconbridge Gold Corporation.

The mine is 20 km east of Timmins. See Map 13, No. 10, on page 145. Access is by a road, 0.4 km long, leading south from Highway 101 at **km 41.5**.

Refs.: 51 p. 116-117; 56a p. 110-113; 116b p. 243.

Maps (T): 41 A/11 Pamour
(G): P2123 Whitney Township, district of Cochrane (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 42.9 Pamour mine on right.

Pamour mine

NATIVE GOLD, PYRITE, PYRRHOTITE, SPHALERITE, ARSENOPYRITE, CHALCOPYRITE, GALENA, SYLVANITE, TOURMALINE

In quartz veins cutting greywacke, basalt, and conglomerate

Coarse visible gold was found in 1911 on this property, which includes the following original claims: LaPalme, Three Nations, and Porcupine Grande. Auriferous pyrite and small amounts of pyrrhotite, sphalerite, arsenopyrite, chalcopyrite, galena, sylvanite, and black tourmaline are associated with the gold.

The mine is 4.5 km west of the Falconbridge Metallurgical Site. See Map 13, No. 3, on page 145. Access is from Highway 101 at **km 40.5** (see road log on page 143).

Refs.: 32b p.34-36; 116d p.255; 259 p. 143.

Maps (T): 42 A/11 Pamour
(G): 48n Bigwater Lake area, district of Cochrane, Ontario (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 41.5 Junction, Highway 101 and a road (on left) leading south to Hoyle mine.

Hoyle mine

NATIVE GOLD, PYRRHOTITE, PYRITE, ARSENOPYRITE, GALENA, SPHALERITE

In quartz veins in conglomerate and greywacke

The gold-bearing veins contain pyrite and pyrrhotite with minor arsenopyrite, galena, and sphalerite. Gold occurs as grains in quartz and as minute particles in sulphide minerals.

The deposit was originally staked by Messrs Lang and Dipaolo. Hollinger Gold Mines Limited began exploration in 1935. The mine was brought to production in 1941-1943 by Hoyle Gold Mines Limited and work was continued in 1945-1948 by Hoyle Mining Company Limited. It was serviced by a shaft sunk to 549 m. In 1977-1978, Pamour Porcupine Mines Limited worked the deposit from a shaft and from an open pit located south of the shaft. Total gold production amounted to 2 234 533 g. The property belongs to Falconbridge Gold Corporation.

The mine is 20 km east of Timmins. See Map 13, No. 10, on page 145. Access is by a road, 0.4 km long, leading south from Highway 101 at **km 41.5**.

Refs.: 51 p. 116-117; 56a p. 110-113; 116b p. 243.

Maps (T): 41 A/11 Pamour
(G): P2123 Whitney Township, district of Cochrane (Ontario Geological Survey, 1:15 840)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

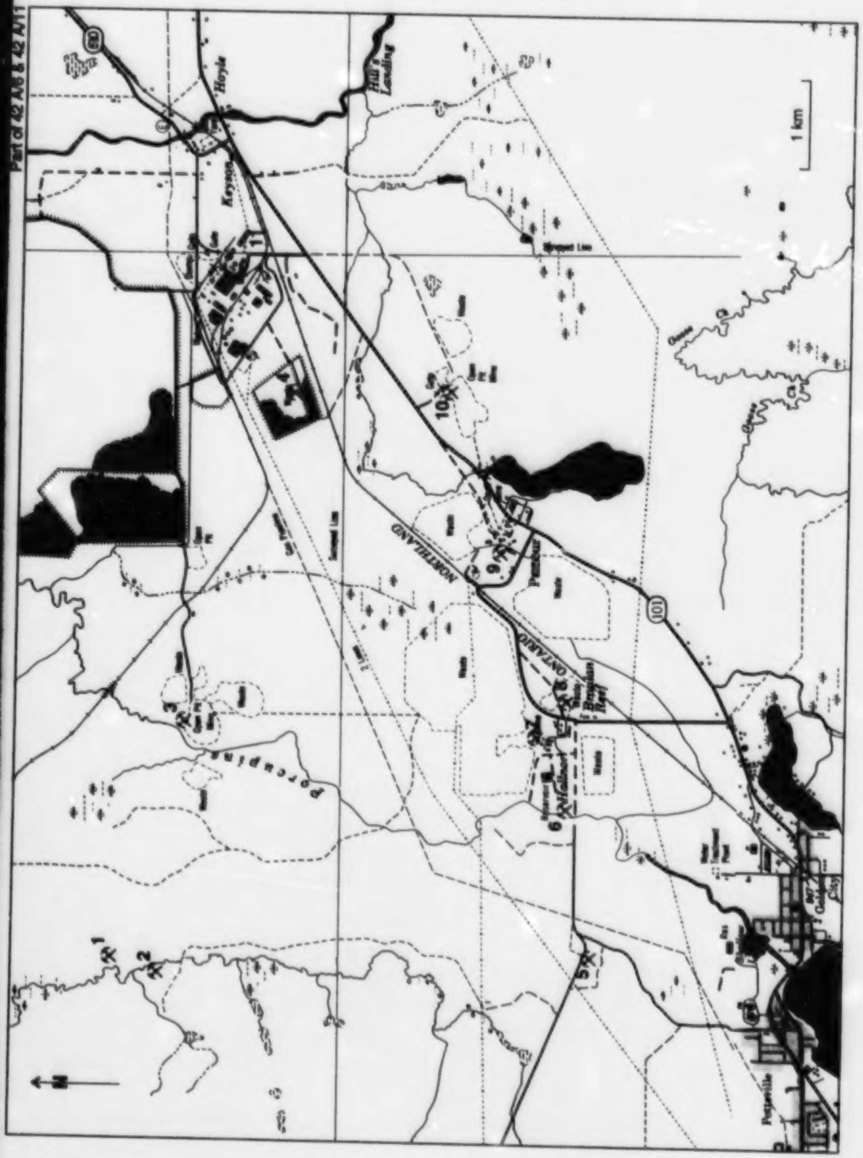
km 41.9 Pamour mine on right.

Pamour mine

NATIVE GOLD, PYRITE, PYRRHOTITE, SPHALERITE, ARSENOPYRITE, CHALCOPYRITE, GALENA, SYLVANITE, TOURMALINE

In quartz veins cutting greywacke, basalt, and conglomerate

Coarse visible gold was found in 1911 on this property, which includes the following original claims: LaPalme, Three Nations, and Porcupine Grande. Auriferous pyrite and small amounts of pyrrhotite, sphalerite, arsenopyrite, chalcopyrite, galena, sylvanite, and black tourmaline are associated with the gold.



Map 13. Porcupine area
1. Marlhill mine 2. Bell Creek mine 3. Owl Creek mine 4. Hoyle Pond mine
5. Reef mine 6. Bonetal mine 7. Halnor mine 8. Broulan Reef mine
9. Pamour mine 10. Hoyle mine 11. Falconbridge Metallurgical Site

This mine is one of the few remaining gold producers in the Porcupine area. Initial development was undertaken in 1911 by LaPalme Porcupine Mines Limited, and in 1912-1914 by Three Nations Gold Mining Company Limited. The mine was brought into production in 1936 by Pamour Porcupine Mines Limited, which worked the deposit until 1986. Giant Yellowknife Mines Limited was the operator from 1987 to 1991 when Royal Oak Mines Inc. took over. Workings consist of several open pits and a 760 m shaft. To the end of 1991, the mine produced 134 237 188.8 g of gold.

The mine and mill are on Highway 101 at **km 42.9**. See Map 13, No. 9, on page 145.

Refs.: 18 p. 247, 248; 51 p. 119-120; 116b p. 243; 120 p. 14-15; 135 p. 125; 150 p. 558-565;
251 p. 258-259.

Maps (T): 42 A/11 Pamour
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)

km 46.3 **Junction, Highway 101 and a road (on right) to Broulan Reef mine, Hallnor mine, Bonetal mine, and Reef mine.**

Broulan Reef mine

NATIVE GOLD, PYRITE, PYRRHOTITE, GALENA, CHALCOPYRITE

In quartz-carbonate veins cutting slate and greywacke

The ore at this former producer consisted of native gold, pyrite, and minor amounts of pyrrhotite, galena, and chalcopyrite.

Plate 28

On the Porcupine trail in 1910, the year before the railway was completed to South Porcupine. (Courtesy of Ontario Archives Acc.16959-182)

This mine is one of the few remaining gold producers in the Porcupine area. Initial development was undertaken in 1911 by LaPalme Porcupine Mines Limited, and in 1912-1914 by Three Nations Gold Mining Company Limited. The mine was brought into production in 1936 by Pamour Porcupine Mines Limited, which worked the deposit until 1986. Giant Yellowknife Mines Limited was the operator from 1987 to 1991 when Royal Oak Mines Inc. took over. Workings consist of several open pits and a 760 m shaft. To the end of 1991, the mine produced 134 237 188.8 g of gold.

The mine and mill are on Highway 101 at **km 42.9**. See Map 13, No. 9, on page 145.

Refs.: 18 p. 247, 248; 51 p. 119-120; 116b p. 243; 120 p. 14-15; 135 p. 125; 150 p. 558-565;
251 p. 258-259.

Maps (T): 42 A/11 Pamour
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)

km 46.3 Junction, Highway 101 and a road (on right) to Broulan Reef mine, Hallnor mine, Bonetal mine, and Reef mine.

Broulan Reef mine

NATIVE GOLD, PYRITE, PYRRHOTITE, GALENA, CHALCOPYRITE

In quartz-carbonate veins cutting slate and greywacke

The ore at this former producer consisted of native gold, pyrite, and minor amounts of pyrrhotite, galena, and chalcopyrite.

Plate 28

On the Porcupine trail in 1910, the year before the railway was completed to South Porcupine. (Courtesy of Ontario Archives Acc.16959-182)

The deposit was discovered in the winter of 1934-1935 during an extensive program of diamond-drilling in the region following the discovery of large orebodies at the Pamour mine in 1932. It was operated by Broulan Porcupine Mines Limited from 1936 to 1950, and by Broulan Reef Mines Limited from 1951 until it was closed in 1953. Production from 1939 to 1953 totalled 7 581 574 g of gold and 828 801.6 g of silver from 1 038 568 t of ore milled. The mine was serviced by a shaft sunk to a depth of 206 m.

The mine is 1.6 km north of Highway 101 at **km 46.3** (see road log below to Hallnor mine). See Map 13, No. 8, on page 145.

Refs.: 3 p. 554; 51 p. 114-115.

Maps (T): 42 A/11 Pamour
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Hallnor mine

NATIVE GOLD, PYRITE, SPHALERITE, PYRRHOTITE

In quartz-calcite veins in basalt and argillite

The highest grade of ore at this former producer occurred in quartz-calcite veins carrying native gold and some sulphide minerals. Ore was also obtained from a zone of altered sericitic rock mineralized with finely disseminated pyrite and pyrrhotite.

Noranda Mines Limited found the deposit by diamond drilling in 1936 during exploration of the area following the discovery of new orebodies at the Pamour mine in 1932. Hallnor Mines Limited operated the mine from 1936 to 1971, producing 49 164 356 g of gold and 3 520 548 g of silver valued at almost $58 million. Pamour Porcupine Mines Limited worked the mine between 1972 and 1982. Operations were conducted from a 1058 m shaft with a winze to 1135 m and an internal shaft to 1543 m. See Map 13, No. 7, on page 145.

Road log from Highway 101 at **km 46.3** (see road log on page 146):

km	0	Junction; proceed onto the road leading north.
	1.6	Broulan Reef mine on right, at a junction. To reach Hallnor mine, continue straight ahead.
	1.9	Junction; turn left.
	2.1	Hallnor mine on right.

Refs.: 7 p. 547; 51 p. 115-116; 251 p. 147, 259.

Maps (T): 42 A/11 Pamour
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Bonetal mine

The ore zone at this former producer is the western extension of the Hallnor ore deposit.

Original underground development began in 1938 and was carried out from the 110 m and 171 m levels of the Hallnor mine. Production was obtained from 1941 to 1951 from a shaft 174 m deep. Bonetal Gold Mines Limited operated the mine and recovered 1 602 115.5 g of gold and 130 010.5 g of silver. The ore was treated at the Broulan Reef mill.

The mine is just west of the Broulan Reef mine. See Map 13, No. 6, on page 145.

Road log from Highway 101 at **km 46.3** (see road log on page 146):

km	0	Junction; proceed north along the road to Broulan Reef mine.
	1.6	Junction; turn left (west).
	2.4	Bonetal mine.

Ref.: 51 p. 112-113.

Maps (T): 42 A/11 Pamour
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Reef mine

NATIVE GOLD, PYRITE

In quartz veins in basalt and rhyolite

Gold was first recovered from this mine in 1915 and in 1917. The operator at that time was Porcupine Gold Reef Mining Company Limited. Further production was obtained by Porcupine Reef Gold Mines Limited from 1947 to 1951 and by Broulan Reef Mines Limited from 1951 to 1965, for a total yield of nearly 15 551 500 g of gold and 1 213 017 g of silver.

The underground workings extend to a depth of 815 m. In the summer of 1972, the buildings were dismantled and there were a few small dumps on the property. See Map 13, No. 5, on page 145.

Road log from Highway 101 at **km 46.3** (see road log on page 146):

km	0	Junction; proceed north along the road to Broulan Reef mine, Hallnor mine.
	1.6	Broulan Reef mine on right, at a junction; turn left.
	2.4	Bonetal mine on right.
	3.8	Reef mine on right, at a junction.

Ref.: 51 p. 121-122.

Maps (T): 42 A/11 Pamour
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)

(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 48.7 Porcupine, at the junction of Highway 101 and Haileybury Crescent leading to Porcupine Lake mine.

Porcupine Lake mine

NATIVE GOLD, PYRITE

In quartz and in sericitic carbonate schist

This deposit was discovered by H.F. Hunter in 1908, one year before the prospecting rush began in the Porcupine district; visible gold was noted by Hunter in sugary quartz and in rusty- weathered schist exposed along the east shore of Porcupine Lake. Porcupine Lake Gold Mines Limited explored the deposit by diamond drilling beneath the ice in the winter of 1911-1912. Encouraging results led the company to install a mill and to develop the deposit by an inclined shaft sunk to a depth of 85.5 m. The work was discontinued at the outbreak of World War I in 1914. The Porcupine Lake Gold Mining Company Limited resumed operations in 1935 and obtained 42 580 g of gold and 2675 g of silver between 1937 and 1944. One mineralized zone 47 m long and 1.2 m wide at the 85.5 m level contained 12.9 g/t of gold.

The mine is on the steep shore of Porcupine Lake. The remnants of the mill and some rock dumps mark the site. See Map 14, No. 12, on page 151.

Plate 29

Porcupine gold miners, 1910. (Courtesy of Ontario Archives Acc. 16959-239)

(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km 48.7 Porcupine, at the junction of Highway 101 and Haileybury Crescent leading to Porcupine Lake mine.

Porcupine Lake mine

NATIVE GOLD, PYRITE

In quartz and in sericitic carbonate schist

This deposit was discovered by H.F. Hunter in 1908, one year before the prospecting rush began in the Porcupine district; visible gold was noted by Hunter in sugary quartz and in rusty- weathered schist exposed along the east shore of Porcupine Lake. Porcupine Lake Gold Mines Limited explored the deposit by diamond drilling beneath the ice in the winter of 1911-1912. Encouraging results led the company to install a mill and to develop the deposit by an inclined shaft sunk to a depth of 85.5 m. The work was discontinued at the outbreak of World War I in 1914. The Porcupine Lake Gold Mining Company Limited resumed operations in 1935 and obtained 42 580 g of gold and 2675 g of silver between 1937 and 1944. One mineralized zone 47 m long and 1.2 m wide at the 85.5 m level contained 12.9 g/t of gold.

The mine is on the steep shore of Porcupine Lake. The remnants of the mill and some rock dumps mark the site. See Map 14, No. 12, on page 151.

Plate 29

Porcupine gold miners, 1910. (Courtesy of Ontario Archives Acc. 16959-239)

Road log from Highway 101 at Porcupine (**km 48.7**, see road log on page 149):

km 0 From Highway 101, proceed south onto Haileybury Crescent.

0.5 Junction, gravel road; turn right.

0.7 Porcupine Lake mine on right.

Refs.: 18 p. 246; 24 p. 84; 51 p. 120-121; 221 p. 500, 565.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km 49.1 Highway 101, bridge over Porcupine River.

km 49.8 Junction, Highway 101 and the road to Bell Creek mine and Marlhill mine.

Bell Creek mine, Marlhill mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, CHALCOPYRITE, TOURMALINE, MICA, GRAPHITE

In quartz veins in basalt and argillite

Gold is associated with disseminated pyrite, arsenopyrite, pyrrhotite, and chalcopyrite in quartz-carbonate-sericite veins. Brown tourmaline and bright green mica (fuchsite) occur in the auriferous veins. Platelets of native gold are associated with the green mica. Pyrite crystals occur in the host rock.

Broulan Reef Mines Limited first explored the deposit in 1958. In 1980-1981, Rosario Resources Canada Limited discovered new gold zones. In 1983, Canamax Resources Incorporated began underground development and brought the Bell Creek mine into production in 1987. The mine is serviced by a shaft and an internal decline extending to a depth of 300 m. The Marlhill mine, 1 km to the north, began production in 1989. It is serviced by a decline driven to the 150 m level. Operations at both mines ended in 1991. The properties belong to Falconbridge Gold Corporation. The Bell Creek mine produced 3 483 162.7 g of gold from 1987 to 1991.

The mines are about 19 km north of Timmins. The Bell Creek mine is on the west side of Bell Creek, and the Marlhill mine, on the east side. The mine road leads north from Highway 101 at **km 49.8** for 7.1 km to the mines. See Map 13, No. 1 and No. 2, on page 145. Enquiries should be made at the Falconbridge Gold Corporation gate at **km 40.5** on Highway 101.

Refs.: 51 p. 132; 56a p. 124-128; 104 p. 37-39; 116b p. 242; 116d p.237, 255; 258 p. 89; 259 p. 143.

Maps (T): 42 A/11 Pamour
(G): 48n Bigwater Lake area, district of Cochrane, Ontario (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Road log from Highway 101 at Porcupine (**km 48.7**, see road log on page 149):

km 0 From Highway 101, proceed south onto Haileybury Crescent.

0.5 Junction, gravel road; turn right.

0.7 Porcupine Lake mine on right.

Refs.: 18 p. 246; 24 p. 84; 51 p. 120-121; 221 p. 500, 565.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km 49.1 Highway 101, bridge over Porcupine River.

km 49.8 Junction, Highway 101 and the road to Bell Creek mine and Marlhill mine.

Bell Creek mine, Marlhill mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, CHALCOPYRITE, TOURMALINE, MICA, GRAPHITE

In quartz veins in basalt and argillite

Gold is associated with disseminated pyrite, arsenopyrite, pyrrhotite, and chalcopyrite in quartz-carbonate-sericite veins. Brown tourmaline and bright green mica (fuchsite) occur in the auriferous veins. Platelets of native gold are associated with the green mica. Pyrite crystals occur in the host rock.

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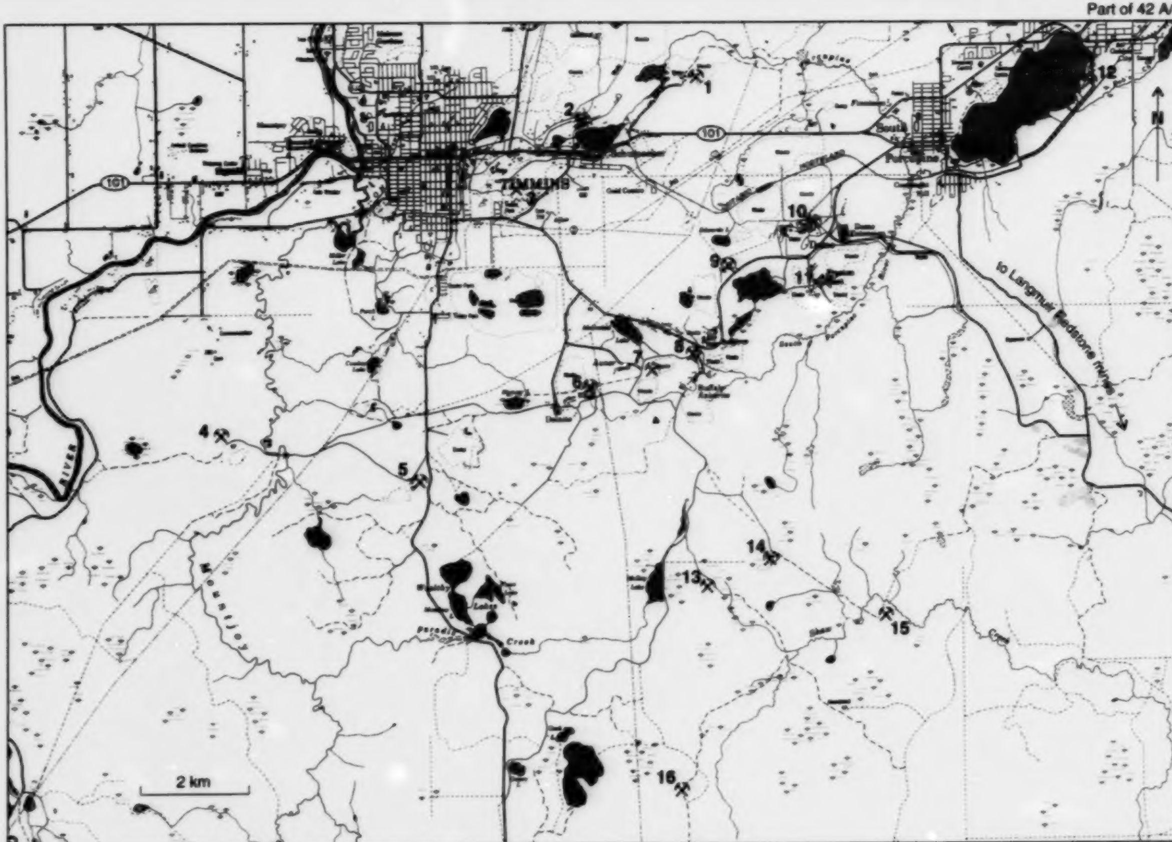
The mines are about 19 km north of Timmins. The Bell Creek mine is on the west side of Bell Creek, and the Marlhill mine, on the east side. The mine road leads north from Highway 101 at **km 49.8** for 7.1 km to the mines. See Map 13, No.1 and No. 2, on page 145. Enquiries should be made at the Falconbridge Gold Corporation gate at **km 40.5** on Highway 101.

Refs.: 51 p. 132; 56a p. 124-128; 104 p. 37-39; 116b p. 242; 116d p.237, 255; 258 p. 89; 259 p. 143.

Maps (T): 42 A/11 Pamour
(G): 48n Bigwater Lake area, district of Cochrane, Ontario (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)



Map 14. Timmins area

1. Coniaurum mine 2. McIntyre mine 3. Hollinger mine 4. DeSantis mine 5. Kenilworth mine 6. Delnite mine 7. Aunor mine 8. Buffalo Ankerite mine 9. Paymaster mine 10. Dome mine 11. Preston mine 12. Porcupine Lake mine 13. Bowman mine 14. Faymar mine 15. Slade-Forbes mine 16. Canadian Magnesite occurrence

km	**52.2**	**South Porcupine, at the turnoff from Highway 101 to the business district; this is the starting point for the road log to Langmuir mine and Redstone mine.**

Langmuir mine

PYRRHOTITE, PYRITE, PENTLANDITE, CHALCOPYRITE, MAGNETITE, MILLERITE, CHROMITE

In peridotite

Sulphide minerals occur as disseminations and in massive form in peridotite. The massive ore consists of pyrrhotite and pentlandite with minor chalcopyrite. Magnetite and chromite are also present. Millerite occurs with disseminated pyrite.

The orebody was developed jointly by Noranda Mines Limited and International Nickel Company of Canada Limited in 1970, followed by production from 1973 to 1978. In 1990, Timmins Nickel Incorporated resumed underground development and began production in 1991. The deposit was originally worked from a shaft sunk to 453 m; the mine is currently serviced by a decline to the 106 m level. Operations were suspended in 1992 due to disappointing results.

The mine is 35 km southeast of Timmins.

Road log from Highway 101 at **km 52.2**:

km	0	South Porcupine; proceed south onto Main Street toward the business section.
	0.8	Turn left onto Golden Avenue.
	0.95	Turn right onto Evans Street.
	1.6	Turn left onto Charles Avenue.
	1.7	Turn right onto Tisdale Street (which continues as Langmuir Mine Road).
	12.6	Bridge over Redstone River.
	15.6	Junction, Springer Road; continue straight ahead.
	15.9	Turnoff (left) to *Tommy Burns mine*. This mine was investigated for gold at various times between 1917 and 1965; a small amount of gold was produced in 1917 by Tommy Burns Gold Mining Company. Gold occurred with pyrite in quartz veins cutting basalt and iron-formation. The iron-formation consists of alternating bands of hematite, chert, and magnetite. Development consists of three shafts sunk to depths of 32 m, 38 m, and 67 m respectively. Access is by a road 1.1 km long leading east from km 15.9.
	25.7	Langmuir mine.

Refs.: 14 p. 87, 89; 32a p. 10-21; 51 p. 88-89; 120 p. 91; 251 p. 246; 254 p. 252; 259 p. 349.

Maps (T): 42 A/6 Timmins
(G): 2206 Langmuir and Blackstock townships, Timiskaming district (Ontario Geological Survey, 1:31 680)
(G): 2455 Timmins Precambrian geology (Ontario Ministry of Natural Resources, 1:50 000)

Redstone mine

PYRRHOTITE, PENTLANDITE, PYRITE, MILLERITE

At the contact of ultramafic and felsic volcanic rocks

The nickel orebody consists of massive and disseminated pyrrhotite and pentlandite. Pyrite and millerite are present in minor amounts.

The deposit was originally investigated by Utah Mines Limited between 1976 and 1978. It was mined by Timmins Nickel Incorporated from 1989 to 1992. A decline from the surface reached a depth of 244 m.

The mine is 37.5 km southeast of Timmins.

Road log from Highway 101 at **km 52.2** (see road log on page 152):

km	0	South Porcupine; proceed south onto Main Street. Follow the road log leading to the Langmuir mine.
	15.6	Junction; turn right (west) onto Springer Road.
	25.6	Junction; turn right (west) onto the Timmins Nickel road.
	28.2	Redstone mine.

Refs.: 66a p. 45-47; 116b p. 244; 116d p. 235; 259 p. 349.

Maps (T): 42 A/6 Timmins
(G): 2274 Adams and Eldorado townships, district of Cochrane (Ontario Geological Survey, 1:31 680)
2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km	**53.6**	**Junction, Highway 101 and Back Road. The mines along Back Road are described on pages 162 to 169.**
km	**57.8**	**Junction, Highway 101 and Carium Road on right leading to Coniaurum mine.**

Coniaurum (Rea) mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, MARCASITE, TOURMALINE, CHLORITE, NATIVE COPPER

In quartz-carbonate veins occupying fractures in basalt and in quartz-feldspar porphyry

This mine includes the original Rea and Armstrong-Booth claims where remarkably rich surface showings were found in the early days of the camp. On the Armstrong-Booth claim (south of the present workings), a rocker was at one time used to recover gold from decomposed surface veins. The deposit consisted of veins containing visible gold associated with pyrite (as nodules, grains, and cubes), chalcopyrite, marcasite, tourmaline, and chlorite. Native copper has been reported. Some quartz was dark bluish due to the inclusion of tourmaline.

km 52.2 South Porcupine, at the turnoff from Highway 101 to the business district; this is the starting point for the road log to Langmuir mine and Redstone mine.

Langmuir mine

PYRRHOTITE, PYRITE, PENTLANDITE, CHALCOPYRITE, MAGNETITE, MILLERITE, CHROMITE

In peridotite

Sulphide minerals occur as disseminations and in massive form in peridotite. The massive ore consists of pyrrhotite and pentlandite with minor chalcopyrite. Magnetite and chromite are also present. Millerite occurs with disseminated pyrite.

The orebody was developed jointly by Noranda Mines Limited and International Nickel Company of Canada Limited in 1970, followed by production from 1973 to 1978. In 1990, Timmins Nickel Incorporated resumed underground development and began production in 1991. The deposit was originally worked from a shaft sunk to 453 m; the mine is currently serviced by a decline to the 106 m level. Operations were suspended in 1992 due to disappointing results.

The mine is 35 km southeast of Timmins.

Road log from Highway 101 at **km 52.2**:

km 0 South Porcupine; proceed south onto Main Street toward the business section.

0.8 Turn left onto Golden Avenue.

0.95 Turn right onto Evans Street.

1.6 Turn left onto Charles Avenue.

1.7 Turn right onto Tisdale Street (which continues as Langmuir Mine Road).

12.6 Bridge over Redstone River.

15.6 Junction, Springer Road; continue straight ahead.

15.9 Turnoff (left) to *Tommy Burns mine*. This mine was investigated for gold at various times between 1917 and 1965; a small amount of gold was produced in 1917 by Tommy Burns Gold Mining Company. Gold occurred with pyrite in quartz veins cutting basalt and iron-formation. The iron-formation consists of alternating bands of hematite, chert, and magnetite. Development consists of three shafts sunk to depths of 32 m, 38 m, and 67 m respectively. Access is by a road 1.1 km long leading east from km 15.9.

25.7 Langmuir mine.

Refs.: 14 p. 87, 89; 32a p. 10-21; 51 p. 88-89; 120 p. 91; 251 p. 246; 254 p. 252; 259 p. 349.

Maps (T): 42 A/6 Timmins

(G): 2206 Langmuir and Blackstock townships, Timiskaming district (Ontario Geological Survey, 1:31 680)

(G): 2455 Timmins Precambrian geology (Ontario Ministry of Natural Resources, 1:50 000)

Redstone mine

PYRRHOTITE, PENTLANDITE, PYRITE, MILLERITE

At the contact of ultramafic and felsic volcanic rocks

The nickel orebody consists of massive and disseminated pyrrhotite and pentlandite. Pyrite and millerite are present in minor amounts.

The deposit was originally investigated by Utah Mines Limited between 1976 and 1978. It was mined by Timmins Nickel Incorporated from 1989 to 1992. A decline from the surface reached a depth of 244 m.

The mine is 37.5 km southeast of Timmins.

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Maps (T): 42 A/6 Timmins
(G): 2274 Adams and Eldorado townships, district of Cochrane (Ontario Geological Survey, 1:31 680)
2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km	**53.6**	**Junction, Highway 101 and Back Road. The mines along Back Road are described on pages 162 to 169.**
km	**57.8**	**Junction, Highway 101 and Carium Road on right leading to Coniaurum mine.**

Coniaurum (Rea) mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, MARCASITE, TOURMALINE, CHLORITE, NATIVE COPPER

In quartz-carbonate veins occupying fractures in basalt and in quartz-feldspar porphyry

This mine includes the original Rea and Armstrong-Booth claims where remarkably rich surface showings were found in the early days of the camp. On the Armstrong-Booth claim (south of the present workings), a rocker was at one time used to recover gold from decomposed surface veins. The deposit consisted of veins containing visible gold associated with pyrite (as nodules, grains, and cubes), chalcopyrite, marcasite, tourmaline, and chlorite. Native copper has been reported. Some quartz was dark bluish due to the inclusion of tourmaline.

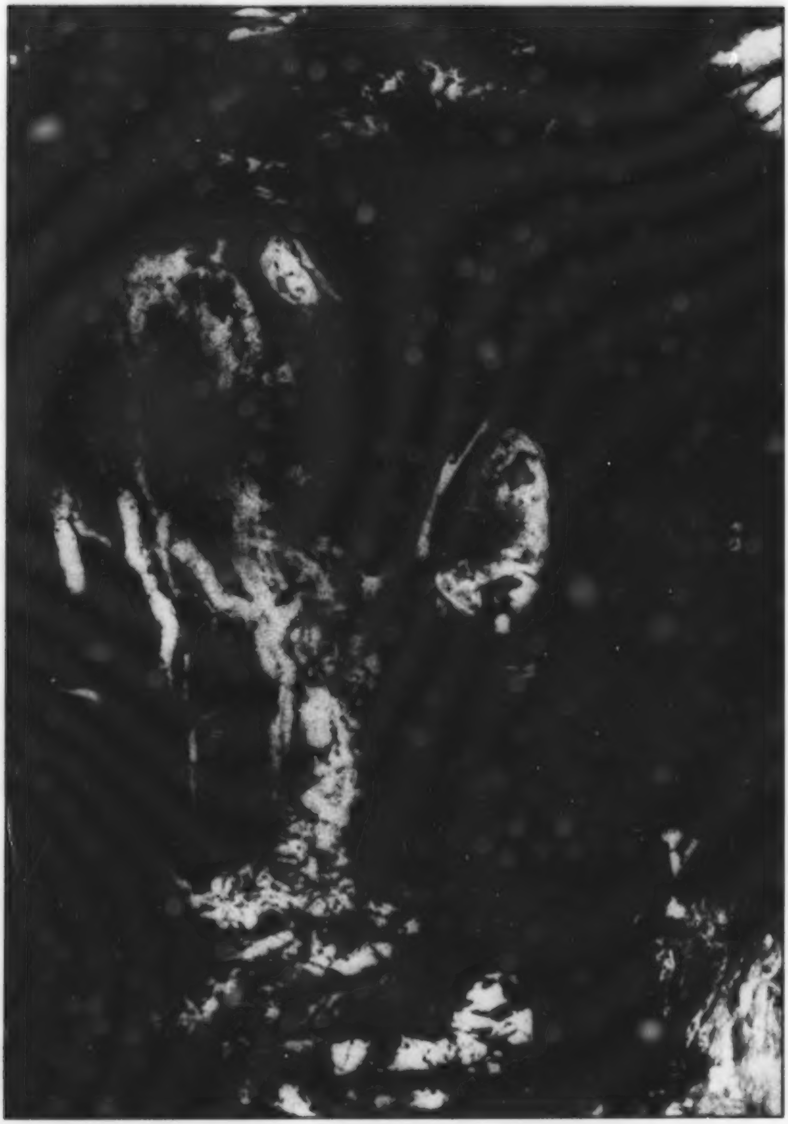

Plate 30

Coniaurum mine. Miners examine a rich vein at the 213 m level, about 1935. (National Archives of Canada PA 17521)

Initial development and mining of the deposit was conducted between 1910 and 1916 by Rea Consolidated Gold Mines Limited, and from 1916 to 1918 by Newray Mines Limited. Some gold was produced, but the values decreased below the 61 m level. Mining was from a shaft 122 m deep. In 1922, Coniaurum Mines Limited undertook development by sinking a new shaft from which production was obtained continuously from 1928 to 1960, and in 1961. The main shaft provided access to underground workings to a depth of 1677 m below the surface. Precious metals recovered from the deposit since 1913 amounted to 34 511 000 g of gold and 6112.4 kg of silver. Between 1973 and 1982, Pamour Porcupine Mines Limited investigated the deposit for copper and gold.

Access is by the 1.4 km Carium Road leading north from Highway 101 at **km 57.8**. See Map 14, No. 1, on page 157.

Refs.: 17 p. 30; 18 p. 239, 241; 24 p. 52, 70-71; 30a p. 153-158; 40 p. 103; 51 p. 92-93; 184 p. 105; 220 p. 131, 464, 496; 221 p. 757.

Maps (T): 42 A/6 Timmins
(G): 2075 Tisdale Township, Cochrane district (Ontario Geological Survey, 1:12 000)
2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km 58.9 Schumacher, at the junction of Highway 101 and McIntyre Road leading to McIntyre mine.

McIntyre (Schumacher) mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE, TETRAHEDRITE, ARSENOPYRITE, HESSITE, ALBITE, ANKERITE, SIDERITE, SCHEELITE, TOURMALINE, CHLORITE, HEMATITE, MAGNETITE, BORNITE, TENNANTITE, NATIVE SILVER, MOLYBDENITE, GYPSUM, ANHYDRITE

In lava and in porphyry

This mine ranks second to the Hollinger mine for gold production since mining began in the Porcupine district. It produced continuously from 1912 to 1988. Total recovery of precious metals amounted to about 334 418 000 g of gold and 96 511 000 g of silver. About 355 541 kg of copper were produced from 1963 to 1982.

Gold occurred in the native state and associated with sulphides in quartz-carbonate veins occupying fractures in Keewatin lavas at the contact of quartz-feldspar porphyry and within the porphyry. Gold was also recovered from the copper orebody. In the veins, pyrite and pyrrhotite were commonly associated with gold; other minerals reported from the ore zone include chalcopyrite, sphalerite, tetrahedrite, arsenopyrite, hessite, albite, ankerite, siderite, scheelite (in early operations, large masses were found in the Jupiter claim), and chlorite. Tourmaline has been found in non auriferous quartz veins.

Copper ore occurred in porphyry; the mineralization consisted of chalcopyrite, pyrite, hematite, magnetite, bornite, tetrahedrite, tennantite, native silver (associated with bornite), molybdenite, gypsum, and anhydrite.

The McIntyre mine comprised several properties around Pearl Lake that were staked in the early days of the camp. One of the claims was the spectacularly rich gold-bearing quartz outcrop discovered in the fall of 1909 by Alexander (Sandy) McIntyre who had earlier prospected several

Initial development and mining of the deposit was conducted between 1910 and 1916 by Rea Consolidated Gold Mines Limited, and from 1916 to 1918 by Newray Mines Limited. Some gold was produced, but the values decreased below the 61 m level. Mining was from a shaft 122 m deep. In 1922, Coniaurum Mines Limited undertook development by sinking a new shaft from which production was obtained continuously from 1928 to 1960, and in 1961. The main shaft provided access to underground workings to a depth of 1677 m below the surface. Precious metals recovered from the deposit since 1913 amounted to 34 511 000 g of gold and 6112.4 kg of silver. Between 1973 and 1982, Pamour Porcupine Mines Limited investigated the deposit for copper and gold.

Access is by the 1.4 km Carium Road leading north from Highway 101 at **km 57.8**. See Map 14, No. 1, on page 157.

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Maps (T): 42 A/6 Timmins
(G): 2075 Tisdale Township, Cochrane district (Ontario Geological Survey, 1:12 000)
2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km 58.9 Schumacher, at the junction of Highway 101 and McIntyre Road leading to McIntyre mine.

McIntyre (Schumacher) mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE, TETRAHEDRITE, ARSENOPYRITE, HESSITE, ALBITE, ANKERITE, SIDERITE, SCHEELITE, TOURMALINE, CHLORITE, HEMATITE, MAGNETITE, BORNITE, TENNANTITE, NATIVE SILVER, MOLYBDENITE, GYPSUM, ANHYDRITE

In lava and in porphyry

This mine ranks second to the Hollinger mine for gold production since mining began in the Porcupine district. It produced continuously from 1912 to 1988. Total recovery of precious metals amounted to about 334 418 000 g of gold and 96 511 000 g of silver. About 355 541 kg of copper were produced from 1963 to 1982.

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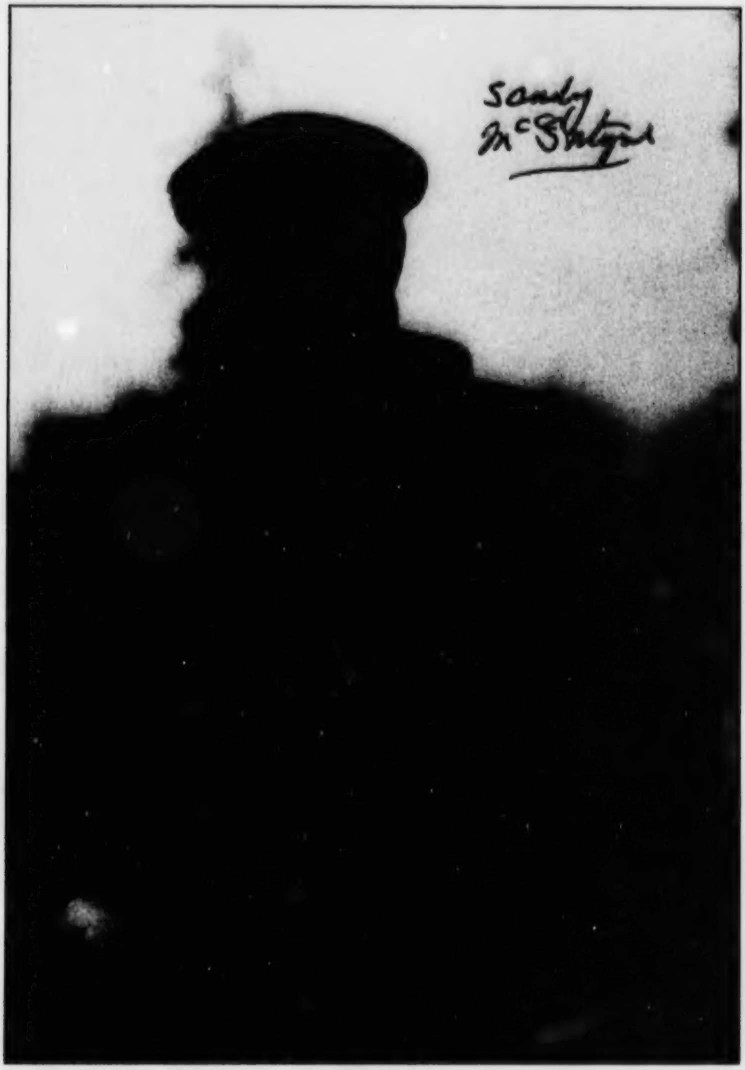

Plate 31

Sandy (Alexander) McIntyre at Red Lake, 1926. Twenty-one years earlier, McIntyre left Scotland for northern Ontario where he joined the construction crew on the Timiskaming and Northern Ontario Railway during the Cobalt boom. He soon became a prospector, taking part in the staking rush in Larder Lake, Swastika, Bourkes, Gowganda, Porcupine, Kirkland Lake, and Red Lake camps. The claims he staked formed the nucleus of two great gold producers - the McIntyre mine in Timmins and the Teck-Hughes mine in Kirkland Lake. (Courtesy of Ontario Archives Acc. 6805 S11807)

Plate 32

McIntyre mine, 1913. (National Archives of Canada PA 30051)

areas including Larder Lake, Bourkes, Gowganda, and Red Lake, and who later discovered gold-bearing veins at Kirkland Lake. Initial underground development of the properties was undertaken in 1910 by Pearl Lake Gold Mines Limited, and in 1911 by Plenaurum Mines Limited, Jupiter Mines Limited, and McIntyre Porcupine Mines Limited. The spectacular surface showings persisted at depth and, as underground development progressed, the operators were rewarded with a succession of high grade ore discoveries. Production began in February 1912 at the original McIntyre property. On the Jupiter property, minute gold nuggets and fine gold were recovered in the early days by panning the ore. The copper orebody was discovered in 1959 by A.T. Griffis, the company's geologist. McIntyre Porcupine Mines Limited operated the mine until 1973, while Pamour Porcupine Mines Limited operated it from 1973 to 1988.

The deposit was developed by 14 shafts and an open pit. The deepest workings are at 2171 m and 2440 m and are serviced by internal shafts; they were the deepest workings of any gold mine in the Porcupine camp. Total gold production was 54 490 620 g.

The mine is on the shore of Pearl Lake at Schumacher. See Map 14, No. 2, on page 151.

Refs.: 20 p. 30; 30 p. 119-122; 41 p. 156; 51 p. 101-102; 52 p. 66, 160; 56 p. 493-496; 67 p. 122-130; 116b p. 243; 206 p. 105-106; 219 p. 131, 426, 534; 251 p. 203-204; 254 p. 226-227.

Maps (T): 42 A/6 Timmins
(G): 2075 Tisdale Township, Cochrane district (Ontario Geological Survey, 1:12 000)
2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km [illegible] Junction, highways 101 and 655.

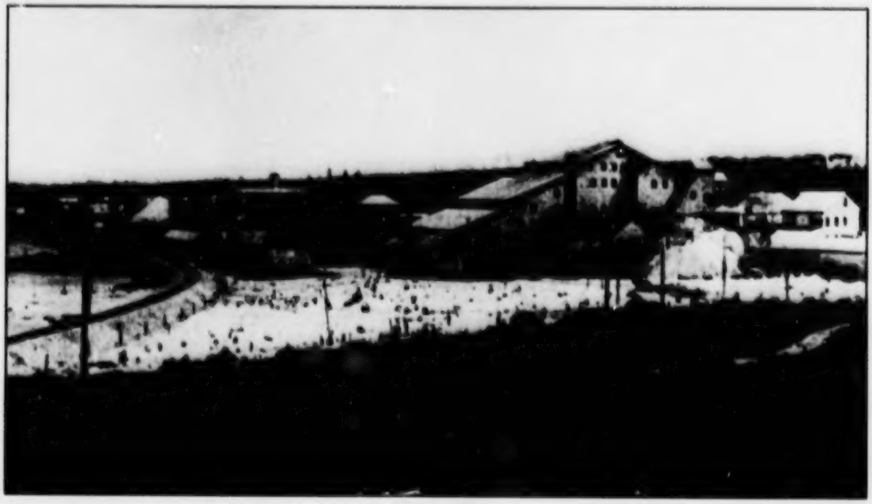

Plate 32

McIntyre mine, 1913. (National Archives of Canada PA 30051)

areas including Larder Lake, Bourkes, Gowganda, and Red Lake, and who later discovered gold-bearing veins at Kirkland Lake. Initial underground development of the properties was undertaken in 1910 by Pearl Lake Gold Mines Limited, and in 1911 by Plenaurum Mines Limited, Jupiter Mines Limited, and McIntyre Porcupine Mines Limited. The spectacular surface showings persisted at depth and, as underground development progressed, the operators were rewarded with a succession of high grade ore discoveries. Production began in February 1912 at the original McIntyre property. On the Jupiter property, minute gold nuggets and fine gold were recovered in the early days by panning the ore. The copper orebody was discovered in 1959 by A.T. Griffis, the company's geologist. McIntyre Porcupine Mines Limited operated the mine until 1973, while Pamour Porcupine Mines Limited operated it from 1973 to 1988.

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Maps (T): 42 A/6 Timmins
(G): 2075 Tisdale Township, Cochrane district (Ontario Geological Survey, 1:12 000)
2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km 60.0 Junction, highways 101 and 655.

Hollinger mine

NATIVE GOLD, PYRITE, PETZITE, HESSITE, COLORADOITE, ALTAITE, TETRADYMITE, TOURMALINE, CHLORITE, CHALCOPYRITE, PYRRHOTITE, SCHEELITE, SPHALERITE, GALENA, SERICITE, ARSENOPYRITE, ALBITE, AXINITE, CLINOZOISITE, EPIDOTE

In veins filling fractures in lava adjacent to porphyries that intruded the lava, and in the porphyries

The Hollinger mine was one of the greatest gold producers on the continent. From 1910 to 1968, when operations ceased due to exhaustion of the ore, it produced 606 811 723 g of gold and 132 030 555 g of silver valued at $567,837,140 from 59 762 554 t of ore milled. This gold production is about twice that recorded to the end of 1968 by the two other leading producers of the area, the McIntyre and Dome mines. The Hollinger mine also produced tungstic oxide (226 500 kg) between 1940 and 1953.

Planche 33

Mine McIntyre, 1972. (GSC 161452)

The ore consisted of visible gold associated principally with pyrite in veins of quartz, of quartz-ankerite, and of quartz-calcite, and in adjacent rocks. Cubes and nodular masses (2 cm in diameter) of pyrite have been reported. Tellurides including petzite and, less commonly, hessite, coloradoite, altaite, and tetradymite, occurred in quartz-ankerite veins. Other minerals reported from the ore zone include: tourmaline, chlorite, chalcopyrite, and pyrrhotite in quartz-ankerite veins; and tourmaline, albite, axinite, clinozoisite, epidote, sericite, and chlorite in quartz-calcite veins. Quartz and sphalerite crystals (5 cm in diameter) have been found lining vugs in quartz-albite gangue.

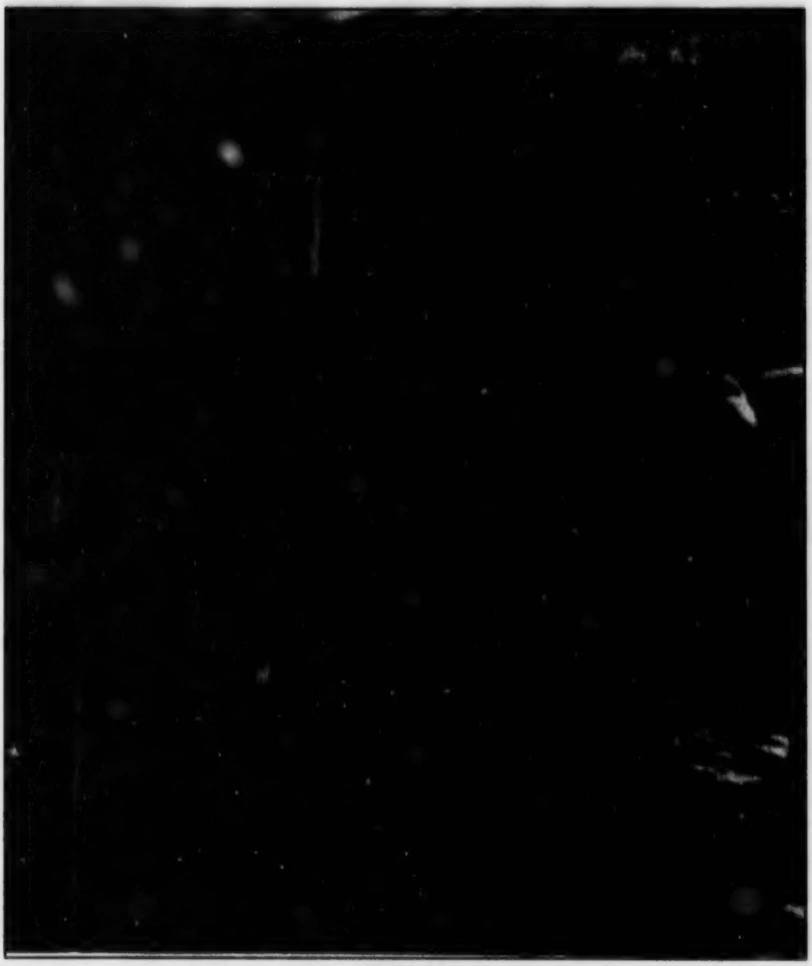

Plate 34

Benny Hollinger at Timmins, 1910. The six claims staked on October 1, 1909, by this teenaged prospector became the original property of the Hollinger (Timmins) mine, Canada's greatest gold producer. (Courtesy of Ontario Archives Acc. 3068-17)

The mine comprised some of the richest and most promising surface showings discovered in 1909; some of these showings, including the sensational discoveries by Benjamin Hollinger, Alex Gillies, Tom Middleton, and John (Jack) Miller who rushed to the area upon hearing about Wilson's discovery of the Dome deposit, led to the Porcupine gold rush. These conspicuous showings near a centuries-old trail used by Indians and Hudson's Bay traders had eluded earlier prospectors including Reuben D'Aigle, a New Brunswick native who prospected in the Yukon for eight years before coming to the Porcupine district in 1906; he investigated some outcrops within a few hundred feet of the discoveries, but failed to record any claims. Development began immediately after the discoveries were made, and the original Hollinger property was the scene of most of the activity in the camp. Hollinger Gold Mines Limited was formed in June 1910 to operate the claims; a mill was in operation the same year, and the first shipment of ore averaged $200 per ton. As development progressed downward, a series of spectacular gold-bearing quartz veins as rich as the surface showings were revealed. At the 30 m level, one high grade quartz vein averaging 2.4 m in width and developed over a 396 m length was reported to contain gold valued at $3 million; equally sensational veins were encountered at the 61 m level. When the fire of July 1911 swept the area, completely destroying the mill and other buildings, it uncovered outcrops containing quartz stringers with rich concentrations of native gold. In 1916, the company became Hollinger Consolidated Gold Mines Limited upon amalgamation of claims worked by Millerton Gold Mines Limited (the Miller-Middleton claims), Acme Gold Mines Limited (the original claims staked by John Miller), and Canadian Mines and Finance Company. The Schumacher Gold Mines Limited property was acquired in 1922.

The mine was developed by numerous shafts; the deepest workings are at 1662 m. The mill had a daily capacity of 3175 to 3625 t; when operations terminated, it was dismantled and parts were sent to the Ross mine at Holtyre. Operations ceased at the mine on April 20, 1968, and at the mill on July 24, 1968. The property was worked in a limited way by McIntyre Porcupine Mines Limited (1969-1973) and Pamour Porcupine Mines Limited (1973-1980).

The mine is in Timmins opposite the junction of highways 101 and 655. See Map 14, No. 3, on page 151. Visits to the mine may be arranged through the Timmins Chamber of Commerce.

Refs.: 24 p. 3, 54-60; 51 p. 99-100; 52 p. 65, 66-67, 68, 160; 70 p. 308; 81 p. 102; 94 p. 106-114; 116b p. 243; 125 p. 111-117; 161 p. 16-17; 206 p. 94, 101-102; 219 p. 137, 150; 220 p. 227, 284, 464; 251 p. 151.

Plate 35

Hollinger (Timmins) mine, about 1912. The surface buildings were rebuilt after the fire of 1911. Miller Lake (foreground) has since been filled and is now the site of a municipal park. (National Archives of Canada PA 29927)

Maps (T): 42 A/6 Timmins
(G): 2075 Tisdale Township, Cochrane district (Ontario Geological Survey, 1:12 000)
2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Kidd Creek mine

CHALCOPYRITE, SPHALERITE, PYRITE, PYRRHOTITE, GALENA, NATIVE SILVER, CASSITERITE, PYRARGYRITE, BISMUTH, BISMUTHINITE, BORNITE, TENNANTITE, COVELLITE, KIDDCREEKITE, CARROLLITE, CLAUSTHALITE, NAUMANNITE, MAWSONITE, CHALCOCITE, COLUSITE, BOHDANOWICZITE, JUNOITE, LAITAKARITE, COBALTITE, EUCAIRITE, ELECTRUM, KESTERITE, CADMOSELITE, DIGENITE, STANNOIDITE, KLOCKMANNITE, CATTIERITE, ACANTHITE, ENARGITE, RUTILE, NICKELINE, FISCHESSERITE, ROQUESITE, SCHEELITE, TUNGSTENITE, SERPENTINE, TALC, CHLORITE

In rhyolite and breccia

Chalcopyrite and sphalerite, the principal ore minerals, are associated with pyrite, pyrrhotite, galena, native silver, cassiterite, pyrargyrite, bismuth, and bismuthinite. Ore minerals occur as stringers, in massive form in rhyolite, and as disseminated fragments in brecciated rhyolite. Bornite, tennantite, and covellite occur with chalcopyrite in a high grade copper (bornite) zone that also carries silver and gold values. A new mineral, kiddcreekite, was found in this zone as microscopic grains in contact with tennantite, bornite, chalcopyrite, and sphalerite; associated minerals (occurring as intergrowths of microscopic grains) are carrollite, clausthalite, pyrite, naumannite, mawsonite, chalcocite, colusite, bohdanowiczite, junoite, laitakarite, cobaltite, eucairite, electrum, sphalerite, kesterite, cadmoselite, digenite, stannoidite, klockmannite, cattierite, acanthite, enargite, rutile, nickeline, fischesserite, roquesite, scheelite, and tungstenite. Serpentine, talc, chlorite, quartz, albite, calcite, dolomite, and tourmaline are associated with the orebody.

The deposit was discovered by Texas Gulf Sulphur Company as a result of an airborne electromagnetic survey followed by a ground magnetic survey and diamond drilling. The announcement in April 1964 of the discovery of an immense base metal deposit in the Timmins area generated the greatest staking rush in the district since the discovery of gold 55 years earlier. Staking by helicopter was done by claim-stakers rushed into the area from distant points in Ontario, Manitoba, and Quebec. In 1965, Ecstall Mining Limited (renamed Texasgulf Canada Limited in 1975, and Kidd Creek Mines Limited in 1981)) was formed to mine the deposit. Production from an open pit occurred from November 1966 to 1979. Underground mining began in 1971 from a shaft that now reaches a depth of 762.5 m. The second shaft, 1403 m below surface, went into production in 1981. A third internal shaft is being sunk to 2300 m below surface. Ore is treated at the Falconbridge Metallurgical Site at **km 39.5** on Highway 101 (see page 143). Falconbridge Limited took over the property in 1986.

The mine produces copper, zinc, lead, and silver, as well as indium, cadmium, tin, and sulphuric acid. Ore reserves are estimated to be sufficient to the year 2008.

The mine is located north of Timmins. Enquiries regarding visits to the property should be directed to the Timmins Chamber of Commerce.

Road log from Timmins:

km	0	Junction, highways 655 and 101; proceed north onto Highway 655.
	0.8	Veins of white massive quartz containing prismatic aggregates of brownish-grey to greyish-yellow clinozoisite are exposed in *roadcuts* on right. Some green flaky chlorite is associated with the clinozoisite. The quartz veins occur in basalt.
	25.6	Kidd Creek mine.

Refs.: 14 p. 72-73; 14a p. 66-76; 48 p. 73-77; 58 p. 103, 107; 68a p. 227-232; 79 p. 190-191, 195-196; 115 p. 7; 116b p. 233; 120 p.116-117; 150a p. 353-360; 157 p. 112-113; 158 p. 113; 159 p. 132-133; 172 p. 121-122; 202a p. 311-317; 207a p. 284; 242 p. 1, 11, 12; 243 p.1; 259 p. 144.

Maps (T): 42 A/11 Pamour
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km	61.1	Intersection of Pine Street and Highway 101.

Mines along Back Road

Road log to mines along Back Road (mines are described in the text following the road log):

km	0	Timmins, at the intersection of Pine Street and Algonquin Boulevard East (Highway 101); proceed south along Pine Street.
km	1.1	Intersection Moneta Avenue; turn left.
km	2.2	Junction, Vipond Road. "Chicken Feet" lava, a dark greenish-grey rock streaked with white to light grey angular or lath-shaped fragments is exposed in a *roadcut* on Vipond Road, 0.3 km from this junction. The rock contains tiny pyrite cubes and is Keewatin in age. It also occurs at the McIntyre and Hollinger mines (Refs.: 52 p. 12, 16; 67 p. 124).
km	4.2	Junction, road on right leading to Aunor mine (page 163), Delnite mine (page 163).
km	5.1	McDonald Lake on right.
km	6.4	Junction. Buffalo Ankerite mine on right; the road leading south from this junction leads to Paymaster mine, Slade-Forbes mine, Bowman mine.
km	7.2	Turnoff (left) to Paymaster mine (No. 3 shaft).
km	7.9	Turnoff (left) to Paymaster mine (No. 4 shaft).
km	10.3	Turnoff to Preston mine on right.
km	11.1	Turnoff to Dome mine on left.

km	11.7	Junction at South Porcupine; turn left.
km	12.2	Junction of Highway 101 at km 53.6 (see road log on page 153).

Aunor mine

NATIVE GOLD, TOURMALINE, SCHEELITE, PYRITE, CHALCOPYRITE

In quartz-ankerite veins in sheared volcanic rocks

Fine visible gold occurred in brown to grey and milky quartz, and in wall rock. Brown tourmaline, scheelite, and small amounts of pyrite and chalcopyrite occurred in the deposit.

The deposit was discovered and staked by two brothers, John A. Mitchell and W.S. Mitchell, late in 1909 when most of the area near the Hollinger and Dome properties had already been claimed. Some surface work was done in 1910 by the Porcupine Consolidated Mining Company, after which the property remained idle until 1935 when the Mitchell brothers, encouraged by successful developments at the nearby Buffalo Ankerite mine, returned to the area and formed Augite Porcupine Mines Limited to develop the deposit. A shaft was sunk to 313 m; the company's operations ceased in 1938. Aunor Gold Mines Limited acquired the property along with several adjoining claims in 1939 and brought it into production in 1940. In 1964, the company purchased two shafts of the Delnite mine. The Aunor main shaft is 940 m deep and is connected underground to the deep levels of the Delnite mine. The Aunor mine produced gold and silver, and some scheelite that was treated at the Hollinger mill. It was last worked in 1972-1984 by Pamour Porcupine Mines Limited. Total gold production from 1940 to 1984 was 77 826 362 g. The mine ranks fifth in gold production in the Timmins camp. See Map 14, No. 7, on page 151.

Road log from **km 4.2** on Back Road (see road log on page 162):

km	0	At the junction on Back Road, proceed southwest.
	1.0	Junction. Road on left leads 1.6 km to the Aunor mine; road straight ahead leads 1.4 km to the Delnite mine.

Refs.: 1 p. 129, 130; 15 p. 507-515; 51 p. 57-58; 52 p. 160; 120 p. 11-12; 251 p. 38; 254 p. 37-38.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Delnite mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, TOURMALINE, MILLERITE

In quartz-ankerite veins in carbonatized andesite

Gold occurred as visible gold and in association with pyrite and arsenopyrite. Brown tourmaline was a common vein constituent. Acicular millerite was found in calcite (C.S. Longley, pers. comm., 1974).

The deposit was staked in 1909 or 1910 by J.E. McMahon who also did some surface work on it. LaRoche Mines Limited began development by sinking a shaft in 1931-1932, and Delnite Mines Limited continued development in 1934, producing about 31 000 000 g of gold and

Road log from Timmins:

km	0	Junction, highways 655 and 101; proceed north onto Highway 655.
	0.8	Veins of white massive quartz containing prismatic aggregates of brownish-grey to greyish-yellow clinozoisite are exposed in *roadcuts* on right. Some green flaky chlorite is associated with the clinozoisite. The quartz veins occur in basalt.
	25.6	Kidd Creek mine.

Refs.: 14 p. 72-73; 14a p. 66-76; 48 p. 73-77; 58 p. 103, 107; 68a p. 227-232; 79 p. 190-191, 195-196; 115 p. 7; 116b p. 233; 120 p.116-117; 150a p. 353-360; 157 p. 112-113; 158 p. 113; 159 p. 132-133; 172 p. 121-122; 202a p. 311-317; 207a p. 284; 242 p. 1, 11, 12; 243 p.1; 259 p. 144.

Maps (T): 42 A/11 Pamour
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

km 61.1 **Intersection of Pine Street and Highway 101.**

Mines along Back Road

Road log to mines along Back Road (mines are described in the text following the road log):

km	**0**	**Timmins, at the intersection of Pine Street and Algonquin Boulevard East (Highway 101); proceed south along Pine Street.**
km	**1.1**	**Intersection Moneta Avenue; turn left.**
km	**2.2**	**Junction, Vipond Road. "Chicken Feed" lava, a dark greenish-grey rock streaked with white to light grey angular or lath-shaped fragments is exposed in a *roadcut* on Vipond Road, 0.3 km from this junction. The rock contains tiny pyrite cubes and is Keewatin in age. It also occurs at the McIntyre and Hollinger mines (Refs.: 52 p. 12, 16; 67 p. 124).**
km	**4.2**	**Junction, road on right leading to Aunor mine (page 163), Delnite mine (page 163).**
km	**5.1**	**McDonald Lake on right.**
km	**6.4**	**Junction. Buffalo Ankerite mine on right; the road leading south from this junction leads to Faymar mine, Slade-Forbes mine, Bowman mine.**
km	**7.2**	**Turnoff (left) to Paymaster mine (No. 5 shaft).**
km	**7.9**	**Turnoff (left) to Paymaster mine (No. 6 shaft).**
km	**10.3**	**Turnoff to Preston mine on right.**
km	**11.1**	**Turnoff to Dome mine on left.**

km	**11.7**	**Junction at South Porcupine; turn left.**
km	**12.2**	**Junction of Highway 101 at km 53.6 (see road log on page 153).**

Aunor mine

NATIVE GOLD, TOURMALINE, SCHEELITE, PYRITE, CHALCOPYRITE

In quartz-ankerite veins in sheared volcanic rocks

Fine visible gold occurred in brown to grey and milky quartz, and in wall rock. Brown tourmaline, scheelite, and small amounts of pyrite and chalcopyrite occurred in the deposit.

The deposit was discovered and staked by two brothers, John A. Mitchell and W.S. Mitchell, late in 1909 when most of the area near the Hollinger and Dome properties had already been claimed. Some surface work was done in 1910 by the Porcupine Consolidated Mining Company, after which the property remained idle until 1935 when the Mitchell brothers, encouraged by successful developments at the nearby Buffalo Ankerite mine, returned to the area and formed Augite Porcupine Mines Limited to develop the deposit. A shaft was sunk to 313 m; the company's operations ceased in 1938. Aunor Gold Mines Limited acquired the property along with several adjoining claims in 1939 and brought it into production in 1940. In 1964, the company purchased two shafts of the Delnite mine. The Aunor main shaft is 940 m deep and is connected underground to the deep levels of the Delnite mine. The Aunor mine produced gold and silver, and some scheelite that was treated at the Hollinger mill. It was last worked in 1972-1984 by Pamour Porcupine Mines Limited. Total gold production from 1940 to 1984 was 77 826 362 g. The mine ranks fifth in gold production in the Timmins camp. See Map 14, No. 7, on page 151.

Road log from **km 4.2** on Back Road (see road log on page 162):

km	0	At the junction on Back Road, proceed southwest.
	1.0	Junction. Road on left leads 1.6 km to the Aunor mine; road straight ahead leads 1.4 km to the Delnite mine.

Refs.: 1 p. 129, 130; 15 p. 507-515; 51 p. 57-58; 52 p. 160; 120 p. 11-12; 251 p. 38; 254 p. 37-38.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Delnite mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, TOURMALINE, MILLERITE

In quartz-ankerite veins in carbonatized andesite

Gold occurred as visible gold and in association with pyrite and arsenopyrite. Brown tourmaline was a common vein constituent. Acicular millerite was found in calcite (C.S. Longley, pers. comm., 1974).

The deposit was staked in 1909 or 1910 by J.E. McMahon who also did some surface work on it. LaRoche Mines Limited began development by sinking a shaft in 1931-1932, and Delnite Mines Limited continued development in 1934, producing about 31 000 000 g of gold and

2 270 000 g of silver from 1937 to 1964 when operations ceased. The mine consists of three surface shafts and one internal shaft reaching a depth of 1645.5 m. Two of the shafts were sold to Aunor Gold Mines Limited in 1964.

For access to the mine, see the road log to Aunor mine (page 163). See Map 14, No. 6, on page 151.

Refs.: 51 p. 61-62; 194 p. 504; 219 p. 702.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Buffalo Ankerite mine

NATIVE GOLD, TOURMALINE, PYRITE

In quartz-carbonate veins occupying fractures in basalt and porphyry; in dacite

Brown tourmaline was the most common vein constituent; native gold was generally associated with pyrite in the veins and in dacite.

This former producer comprised the Dobie and Macdonald properties, which were among the earliest staked in the Porcupine camp. In 1911, the Dobie Mining Company recovered ore described as remarkably spectacular from the Dobie claim. At about the same time, Maidens Macdonald undertook development of the Macdonald claim. In spite of the promising developments of early operations, production was obtained only in 1926 after sporadic development operations had been conducted by a number of mining companies. The original Dobie property was brought into production by Ankerite Gold Mines Limited, the Macdonald property by March Gold Mines Limited, with milling on both properties. Buffalo Ankerite Gold Mines Limited operated both properties from 1935 to 1953, when operations were terminated due to exhaustion of the ore.

The mine consists of several shafts. The production shaft is 1209 m deep with underground connection to the March shaft on two levels. The mill had a capacity of 363 t per day. Total production amounted to slightly over 31 000 000 g of gold and about 267 486 g of silver from 4 779 890 t of ore milled, for a value of $35 483 916.

The road log to the mine is given on page 162. See Map 14, No. 8, on page 151.

Refs.: 17 p. 30; 51 p. 55-57; 100 p. 515-517; 220 p. 745.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Faymar mine

NATIVE GOLD, PYRITE, EPIDOTE, PLAGIOCLASE, CHLORITE

In quartz veins at the contact of basalt and porphyry

Native gold was associated with pyrite in quartz, basalt, and porphyry at this former gold-silver producer. In the rock dumps, specimens of yellowish-green epidote with white massive quartz, orange-red feldspar, dark green chlorite, and tiny cubes of pyrite are common. The epidote occurs as aggregates of microscopic prisms.

Faymar Porcupine Gold Mines Limited worked the mine from 1938 to 1942 recovering about 684 260 g of gold and some silver. The mine was serviced by a shaft reaching a depth of 338.5 m. A mill operated on the site. See Map 14, No. 14, on page 157.

Road log from Back Road at **km 6.4** (see road log on page 162):

km	0	Junction on Back Road; proceed south along the road leading past the Buffalo Ankerite mine and beyond the residences and tailings.
	2.6	Junction; continue straight ahead.
	3.2	Junction; turn left onto a single-lane road.
	5.3	Faymar mine.

Ref.: 51 p. 63-64.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Slade-Forbes mine

CHRYSOTILE, SERPENTINE, TALC

In serpentinized dunite

Light green chrysotile asbestos (cross-fibre) occurs in veinlets up to 5 cm wide. Light green to medium green massive serpentine, light green picrolite, and talc are associated with it.

Small amounts of asbestos were removed from the deposit by Slade-Forbes Asbestos Company (1917), Canadian Johns-Manville Company Limited (1943), Bell Asbestos Company (1948-1949), Teegana Mines Limited (1951), and Van Packer Mines of Canada Limited (1952). The deposit has been exposed by a pit, 12 m square and 3 to 5 m deep. A mill was operated at the site.

Access is by a single-lane road, 2.4 km long, from the Faymar mine (see road log above). See Map 14, No. 15, on page 151.

Ref.: 51 p. 12-13.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Bowman mine

CHRYSOTILE, SERPENTINE

In serpentinite

Greyish-green to green chrysotile asbestos (cross-fibre) occurs in veinlets up to 10 mm wide in green massive serpentine.

The deposit was operated from a pit 15 m by 40 m and 18 m deep. Asbestos ore was mined by Bowman Asbestos Mines (1923), Porcupine Asbestos Mining Syndicate (1924), Porcupine Asbestos Corporation Limited (1926), and Metro Asbestos Processors Limited (1956); total production reached about 6530 t. In the 1956 operations, most of the ore was treated at the mill at the Slade-Forbes mine. See Map 14, No. 13, on page 151.

Road log from Back Road at **km 6.4** (see road log on page 162):

km	0	From the junction on Back Road, proceed south along the road leading past the Buffalo Ankerite mine and beyond the residences and tailings.
	3.2	Junction, road to Faymar mine and to Slade-Forbes mine; continue straight ahead.
	4.2	Junction; turn left onto a single-lane road.
	5.5	Bowman mine on right.

Refs.: 77 p. 12; 167 p. 103; 211 p. 42.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Canadian Magnesite occurrence

MAGNESITE, TALC, SERPENTINE, HEMATITE, MAGNETITE, STICHTITE, ANHYDRITE, SOAPSTONE

In serpentinite

Magnesite is associated with light green talc and green serpentine in carbonatized serpentinite. Some chrysotile asbestos and small amounts of hematite and magnetite are present. Stichtite and anhydrite have also been found in the deposit (E.G. Bright pers. comm., 1972). Greyish green soapstone suitable for carving occurs in the serpentinite.

The deposit was explored in 1964-1965 and 1970-1972 by Canadian Magnesite Mines Limited. The work consisted of diamond drilling and surface stripping. See Map 14, No. 16, on page 151.

Road log from Back Road at **km 6.4** (see road log on page 162):

km	0	From the junction on Back Road, proceed south along the road leading past Buffalo Ankerite mine and beyond the residences and tailings.
	3.2	Junction, road to Faymar mine and to Slade-Forbes mine; continue straight ahead (south).
	4.2	Junction; turn left onto a single-lane road.
	5.5	Bowman mine on right; continue along the road.
	7.4	Junction; proceed onto the single-lane road on right leading southwest.
	10.8	Canadian Magnesite occurrence.

Ref.: 254 p. 65-66.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Paymaster mine

NATIVE GOLD, PYRITE, GALENA, SPHALERITE, PYRRHOTITE, CHALCOPYRITE, HEMATITE, SCHEELITE, TITANITE, EPIDOTE, AXINITE, TOURMALINE, TALC

In quartz-ankerite veins cutting greenstone, dacite, and basalt

Native gold was generally closely associated with pyrite; most of it was very fine although some coarse gold was also encountered. Sulphides including galena, sphalerite, pyrrhotite, and chalcopyrite were present in small amounts. Hematite, scheelite, titanite, epidote, and light violet axinite have been reported. The dumps furnish specimens of quartz containing feldspar, black tourmaline, chlorite, and talc. Very fine flakes of specularite were noted in specimens of calcite. Grey, fine grained feldspar porphyry and black tourmaline breccia are also found.

The Paymaster property is a consolidation of the original West Dome, West Dome Lake, United Mineral Lands, Apex, and Standard properties where gold was discovered in the early days of the Porcupine camp. The West Dome property was known as the Foster claim and was staked by Bert Hotchkiss a short time after Wilson made his famous discovery of the Dome showing; at the time it was regarded as one of the most remarkable showings of free gold in the district.

Standard Gold Mines Limited and West Dome Mines Limited began development in 1910. Consolidated West Dome Mines Limited and West Dome Lake Gold Mines Limited worked the property from 1915 to 1930. In 1930, Paymaster Consolidated Mines Limited (name changed in 1964 to Porcupine Paymaster Limited) was formed as a result of the amalgamation of four properties, and the company continued mining and milling operations until the mine closed in 1966.

The mine was serviced by nine shafts; the production shaft (No. 5) reached a depth of 1878 m and No. 6 shaft, 147 m. The mill had a capacity of 700 tons per day. Total production of precious metals from about 5 000 000 t of ore milled was 37 081 183 g of gold and 1 011 121 g of silver valued at $42 146 614.

The main workings are located on the north side of Back Road at km 7.2 and km 7.9 (see road log on page 162); other shafts are located south of Simpson Lake. See Map 14, No. 9, on page 151.

Refs.: 17 p. 26; 18 p. 245; 20 p. 51-52; 51 p. 103-104; 112 p. 138-140; 113 p. 520-528; 206 p. 98; 219 p. 668; 244 p. 261.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Preston mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE, GALENA, ARSENOPYRITE, TOURMALINE, SCHEELITE

In quartz veins and porphyry lenses and in basalt

This deposit differed from other Porcupine gold mines in that most of the gold recovered from earlier operations was obtained entirely from porphyry; several varieties of feldspar porphyry ranging in colour from cream to grey and buff, from purplish to almost black were encountered in the mine. Pyrite, chalcopyrite, pyrrhotite, and less commonly, sphalerite, galena, and arsenopyrite were associated with the gold. Abundant coarse gold was encountered in both early and

more recent operations particularly from the quartz-tourmaline veins that contained the high grade ore. Tourmaline and scheelite were also present in the veins. Cubes of auriferous pyrite up to 10 cm in diameter have been reported to occur in the basalt.

The claims staked in 1909 by a group of prospectors including John S. Wilson and Harry A. Preston formed the nucleus of this property. Preston East Dome Mines Limited, renamed Preston Mines Limited in 1960, undertook initial exploration in 1911. In the 1930s, the company acquired other properties including Porphyry Hill (Fogg claim), Porcupine Pet (Bridge claim), and New York Porcupine (Martin claim). Production was obtained from a shaft 728 m deep from which an internal shaft extended to a depth of 1274 m. The mill operated at a capacity of 907 t per day. Some gold was recovered from early operations, but the bulk of it was won between 1938 and 1968. Production amounted to a little over 466 000 000 g of gold and about 5 505 231 g of silver valued at $57 223 000. Operations ended in June 1968.

The mine is south of Back Road at **km 10.3** (see road log on page 162). See Map 14, No. 11, on page 151.

Refs.: 26 p. 513, 516; 51 p. 66, 67, 104-107; 107 p. 143-149; 219 p. 702; 220 p. 745; 251 p. 271.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Plate 36

Summit of Dome, 1911. The Dome, a mound of quartz carrying spectacular concentrations of gold, became the Dome mine. (Courtesy of Ontario Archives Acc. 16959-215)

Dome mine

NATIVE GOLD, PYRITE, PYRRHOTITE, SPHALERITE, GALENA, ARSENOPYRITE, SYLVANITE, ALTAITE, CALAVERITE, TOURMALINE, SCHEELITE, FUCHSITE

In quartz and ankerite veins in basalt and sediments (conglomerate, greywacke, slate), and in porphyry

The Dome mine ranks second for cumulative production of gold in the Porcupine camp, after the Hollinger mine. Its production at the end of 1990 was 60 per cent of that of the Hollinger mine when the latter terminated operations in 1968. It has produced gold every year since 1910, and produced a small amount of copper ore in 1968 and some scheelite ore in the 1940s.

Gold was discovered on this property on August 24, 1909, by John S. Wilson, leader of a group of prospectors including Harry A. Preston, Gilbert Rheault, John Campbell, George Burns, and Phil Macklenberg. The search that resulted in the discovery was stimulated by reports of the rich find made a few days earlier by George Bannerman north of Porcupine Lake. On the Wilson discovery claim, very coarse, nugget-like gold was richly concentrated in patches in a large dome-like outcrop of milky quartz enclosed by schistose volcanic rock; it was regarded as the most sensational showing of native gold in the district and it generated the great Porcupine gold rush of 1909-1910, attracting a throng of prospectors including Benny Hollinger, John Miller, Alex Gillies, and Sandy McIntyre whose discoveries became part of the Hollinger mine and the McIntyre mine. Gold from this dome was mined from a large open pit known as the 'glory hole'. Another phenomenal showing referred to as the Golden Stairway vein was bared by the fire of 1911 that ravaged the Porcupine mining camp; the vein contained streaks of coarse gold about

Plate 37

Dome mine, 1910. (GSC 14116)

6 mm thick and was located about 45 m from the discovery dome; it was described by one prospector as having "gold struck in the quartz all over the place, like candle-drippings" (Ref. 79, p. 193). Another vein, considered by mine engineers to be one of the most striking showings found in any gold camp, was discovered by trenching in the summer of 1991; this vein, 5 to 6 m wide and exposed for 22 m, contained eight pockets of native gold, the most spectacular one being an almost solid mass 6.3 cm by 38 cm. In the early mining days, all gold showings were plastered with black paint so that any high-grading could readily be detected.

At the Dome mine, native gold, often coarse, is associated with pyrite and pyrrhotite in quartz-tourmaline and in ankerite veins, and in the host rocks. Small amounts of sphalerite, galena, arsenopyrite, tellurides – sylvanite, altaite, and calaverite – and scheelite occur in the deposit. Fuchsite is associated with white quartz in carbonate rock.

Mining of the deposit was undertaken early in 1910 by Dome Mines Company Limited (name changed in 1923 to Dome Mines Limited). Open pit and, later, underground methods were used. The mine consists of several surface and internal shafts. The underground workings extend to depths of 1220 m, 1604 m and 1669 m. Total production of precious metals to the end of 1990 amounted to 368 379 670 g of gold and over 58 768 123 g of silver. The current operator is Placer Dome Inc.

The mine is on the north side of Back Road at **km 11.1** (see road log on page 162). See Map 14, No. 10, on page 151.

Refs.: 5b p. 683-684; 18 p. 241-242; 20 p. 48-51; 24 p. 54; 51 p. 96; 52 p. 66, 160; 83 p. 82-98; 116b p. 242; 120 p. 15-17; 206 p. 95-99; 219 p. 249; 220 p. 65, 606; 251 p. 113-114; 254 p. 113.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)
2075 Tisdale Township, Cochrane district (Ontario Geological Survey, 1:12 000)

Mines south of Timmins (via Pine Street)

DeSantis mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, SCHEELITE, TOURMALINE

In quartz-carbonate veins, schistose lava, and carbonate rock

Native gold was associated with pyrite, chalcopyrite, and galena in quartz-carbonate gangue and in host rocks. Scheelite and tourmaline were also present.

The mine produced a small amount of gold and silver. DeSantis Gold Mining Company Limited (1933), DeSantis Porcupine Gold Mines Limited (1939-1942), and Kenilworth Mines Limited (1964) were involved in production. The deposit was developed initially in 1914-1915 when it was known as the Langmuir property. The mine consists of two shafts sunk to depths of 65.5 m and 379.5 m. See Map 14, No. 4, on page 151.

Road log from Timmins:

km 0 Intersection of Algonquin Boulevard (Highway 101) and Pine Street; proceed south onto Pine Street.

km	4.8	Junction; turn right.
	5.3	Junction; proceed straight ahead along a single-lane road.
	8.7	DeSantis mine.

Refs.: 51 p. 82-83; 71 p. 27-28.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Kenilworth (Naybob) mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, GALENA, CHALCOPYRITE, SCHEELITE, TOURMALINE, MAGNESITE, FUCHSITE

In quartz vein in carbonatized schist

Native gold occurred with galena, pyrite, arsenopyrite, and chalcopyrite in quartz that also contained scheelite, ankerite, and black tourmaline. Specimens of white massive quartz containing masses of bright-green mica (fuchsite) and massive buff magnesite are common in the dumps; the quartz-fuchsite rock is used locally as an ornamental stone.

A total of about 1 555 150 g of gold and 155 515 g of silver were obtained from the deposit at various times between 1932 and 1964. Production was from a shaft 411 m deep. The mine was operated intermittently by Hayden Gold Mines Limited (between 1915 and 1933), Naybob Gold Mines Limited (1934-1942), and Kenilworth Mines Limited (1962-1965). During its final period of production, ore was treated at the Coniaurum mill. See Map 14, No. 5, on page 151.

Plate 38

Kenilworth mine, 1972. (GSC 161452)

Road log from Timmins:

km	0	Intersection of Algonquin Boulevard and Pine Street; proceed south along Pine Street.
	4.8	Junction, road to DeSantis mine; continue straight ahead.
	5.5	Junction; follow road on right.
	6.1	Kenilworth mine.

Refs.: 51 p. 85; 71 p. 27-28.

Maps (T): 42 A/6 Timmins
(G): 2455 Timmins Precambrian geology (Ontario Geological Survey, 1:50 000)

Texmont (Fatima) mine

PYRRHOTITE, PENTLANDITE, PYRITE, MILLERITE, CHALCOPYRITE, HEAZLEWOODITE, VIOLARITE, GODLEVSKITE, BROCHANTITE, CHRYSOTILE, PICROLITE, DOLOMITE

In serpentinized peridotite

The ore at this nickel mine consists of pyrrhotite, pentlandite, pyrite, and millerite with minor amounts of chalcopyrite, heazlewoodite, and violarite. Godlevskite has been identified from a drill core specimen; it was associated with pentlandite, millerite, and heazlewoodite. Brochantite was found as a greenish-blue coating on specimens in the dump. Other minerals associated with the deposit are light yellowish-green chrysotile asbestos, yellowish-green picrolite, and white coarsely crystalline dolomite (fluoresces dark pink under long ultraviolet rays).

Fatima Mining Company Limited (renamed Texmont Mines Limited in 1964) began outlining the nickel orebody in 1956 and commenced underground development in 1959 by sinking a shaft to a depth of 241 m. In 1970, the property was leased to Sheridan Geophysics Limited which produced some nickel in 1971-1972. The ore averaged 1 per cent nickel.

Road log from Timmins:

km	0	Intersection of Algonquin Boulevard (Highway 101) and Pine Street; proceed south along Pine Street.
	4.8	Junction, road to DeSantis mine.
	5.5	Junction, road to Kenilworth mine.
	21.7	Junction, road to Papakomeka Lake.
	28.0	Boulders of coarse granite and granite porphyry are strewn along the road.
	33.1	Junction; proceed along the road on left.
	44.4	Junction, mine road; turn left.
	44.9	Junction; follow the road on left.
	50.4	Texmont mine.

Refs.: 14 p. 89-90; 132 p. 879; 172 p. 351-352; 235 p. 102; 251 p. 322.

Maps (T): 42 A/3 Peterlong Lake
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km	**62.2**	**Junction, Highway 101 and Highway 629. This is the starting point for the Timmins West occurrences (see page 175).**
km	**70.8**	**Junction, highways 101 and 576.**

Mines along Highway 576

Genex (Mordey) mine

CHALCOPYRITE, PYRITE, SPHALERITE

In rhyolite and andesite

Copper-zinc ore was produced from this deposit. The sulphides occur as veinlets and lenses in rhyolite and andesite and are associated with a cherty quartz matrix in brecciated lava. The sphalerite is dark brown to black.

Sulphide mineralization was discovered in Godfrey Township by Fred Steep, who was engaged in trapping. He and Philip Sheehan staked the outcrop in 1926, following the successful development of the Kam-Kotia base metal deposit. Subsequently, several concerns undertook surface diamond drilling. In 1966, Genex Mines Limited (re-named Irvington Mining Company Limited) sank a 84.5 m shaft and briefly operated the mill, treating 136 t of ore daily. Operations terminated at the end of 1966.

Access to the property is by a road about 5 km long, leading west from Highway 576 at a point 6.7 km from its junction with Highway 101. See the road log to the Kam-Kotia mine on page 174.

Refs.: 82 p. 43-47; 159 p. 108; 172 p. 119-120.

Maps (T): 42 A/5 Dana Lake
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Canadian Jamieson mine

PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, GALENA, COVELLITE, MALACHITE

In chlorite-carbonate schist

The mine produced copper and zinc. The ore consisted of massive and disseminated sulphides: pyrite, chalcopyrite, sphalerite (dark brown), and pyrrhotite with a small amount of galena. Some pyrite occurred as fine cubes and nodules about 6 mm in diameter. Covellite and malachite have also been reported.

Maps (T): 42 A/3 Peterlong Lake
(G): 2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

km	**62.2**	**Junction, Highway 101 and Highway 629. This is the starting point for the Timmins West occurrences (see page 175).**
km	**70.8**	**Junction, highways 101 and 576.**

Mines along Highway 576

Genex (Mordey) mine

CHALCOPYRITE, PYRITE, SPHALERITE

In rhyolite and andesite

Copper-zinc ore was produced from this deposit. The sulphides occur as veinlets and lenses in rhyolite and andesite and are associated with a cherty quartz matrix in brecciated lava. The sphalerite is dark brown to black.

Sulphide mineralization was discovered in Godfrey Township by Fred Steep, who was engaged in trapping. He and Philip Sheehan staked the outcrop in 1926, following the successful development of the Kam-Kotia base metal deposit. Subsequently, several concerns undertook surface diamond drilling. In 1966, Genex Mines Limited (re-named Irvington Mining Company Limited) sank a 84.5 m shaft and briefly operated the mill, treating 136 t of ore daily. Operations terminated at the end of 1966.

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Refs.: 82 p. 43-47; 159 p. 108; 172 p. 119-120.

Maps (T): 42 A/5 Dana Lake
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Canadian Jamieson mine

PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, GALENA, COVELLITE, MALACHITE

In chlorite-carbonate schist

The mine produced copper and zinc. The ore consisted of massive and disseminated sulphides: pyrite, chalcopyrite, sphalerite (dark brown), and pyrrhotite with a small amount of galena. Some pyrite occurred as fine cubes and nodules about 6 mm in diameter. Covellite and malachite have also been reported.

The deposit was originally staked in 1926. It was restaked in 1941 by George Jamieson, veteran prospector of the area who, in the next few years, performed some surface exploration of the deposit. In 1964, exploration and development were undertaken by Canadian Jamieson Mines Limited which produced copper and zinc concentrates from 1966 to 1971. A shaft 232 m deep was used to hoist the ore.

Access is by a road 0.5 km long leading west from Highway 576 at a point 13.2 km from its junction with Highway 101. See the road log to the Kam-Kotia mine.

Refs.: 14 p. 81-84; 50 p. 27-29; 82 p. 36-41; 120 p. 112-114; 172 p. 118-119.

Maps (T): 42 A/12 Kamiskotia Lake
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Kam-Kotia mine

PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, MAGNETITE, COVELLITE

In sheared volcanic rocks

The mine produced copper, zinc, and some silver and gold. The ore consisted of massive sulphides that formed lenses and stringers in host rocks. Magnetite and covellite have been reported.

The deposit was found beneath a heavy gossan and was originally staked by George Jamieson. From 1926 to 1928, Hollinger Consolidated Gold Mines Limited conducted a program of preliminary development on this property and on additional claims acquired from C.H. Johanesen and A.W. MacDonald. In 1942, copper was produced for the Wartime Metal Corporation. Kam-Kotia Mines Limited operated the mine and mill from 1961 to the end of 1972 when the ore was exhausted. Mining was originally from an open pit; beginning in 1965, ore was hoisted via a shaft 602 m deep. Production totalled 64 938 304 kg of copper, 70 668 000 kg of zinc, 174 301 g of gold, and 20 625 500 g of silver worth approximately $83 549 000.

Kam-Kotia Mines Limited also operated the adjacent Jameland mine. Ore from this mine was treated at the Kam-Kotia mill. The deposit is similar to that at the Kam-Kotia mine.

Road log from Highway 101 at **km 70.8** (see road log on page 173):

km	0	Junction of highways 576 and 101; proceed onto Highway 576.
	6.7	Turnoff (left) to Genex mine.
	11.1	Mount Jamieson (on right), the highest point in the Porcupine area, is composed of rhyolite and rises from a sand- and gravel-covered plain to 416.6 m above sea level with a relief of about 400 feet.
	13.2	Turnoff (left) to Canadian Jamieson mine.
	20.6	Kamiskotia Lake on left.
	24.9	Kam-Kotia mine.

Refs.: 14 p. 78-81; 50 p. 17-26; 120 p. 120-121; 172 p. 126-128; 179 p. 133, 134; 225 p. 117; 251 p. 174-175; 254 p. 180, 181.

Maps (T): 42 A/12 Kamiskotia Lake
(G): P425 The Timmins area, district of Cochrane (Ontario Geological Survey, 1:63 360)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

TIMMINS WEST OCCURRENCES

Card Lake antimony occurrence

BERTHIERITE, STIBNITE, NATIVE ANTIMONY, ULLMANNITE, TETRAHEDRITE-TENNANTITE, VALENTINITE, PYRITE, MARCASITE, PYRRHOTITE, ARSENOPYRITE, SCORODITE, ROMEITE

In sheared rhyolite

The occurrence is an antimony-arsenic deposit, berthierite and arsenopyrite being the principal antimony and arsenic minerals respectively. The metallic minerals occur as intimate intergrowths forming masses and disseminated grains; some minerals are distinguishable only microscopically. The principal gangue mineral is quartz. Secondary minerals that have formed coatings and/or stains on ore specimens include valentinite (white), romeite (yellow), and scorodite (green to brown).

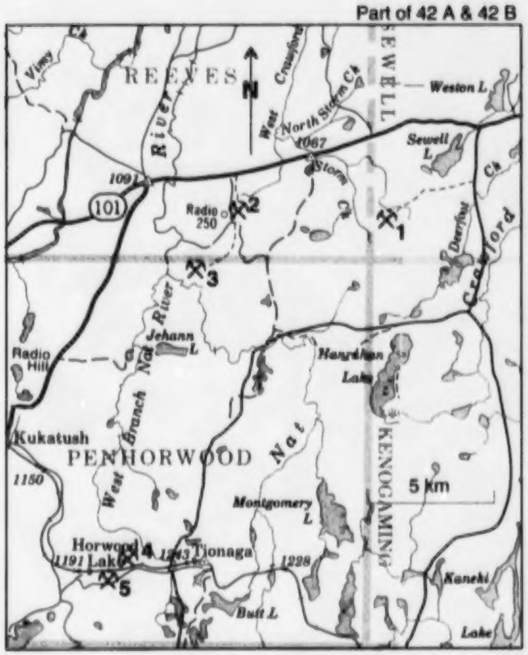
Surface work was done on the outcrop in 1971 by Card Lake Copper Mines Limited. The occurrence is about 67 km west of Timmins. See Map 15, No. 1, on page 176.

Road log from Timmins:

km	0	Timmins, at the junction of highways 101 and 629; proceed west along Highway 101.
	60.0	Junction, Kenogaming Road; turn left (south).
	62.1	Junction; turn right.
	65.5	Junction; follow the trail on right.
	66.7	Card Lake antimony occurrence.

Refs.: 147 p. 1-11; 249 p. 3; 251 p. 71.

Maps (T): 42 A/4 Kenogaming Lake
42 B/1 Foleyet
(G): 2230 Reeves and Sewell townships, Sudbury district (Ontario Geological Survey, 1:63 360)
2116 Chapleau-Foleyet, Algoma, Cochrane, and Sudbury districts (Ontario Geological Survey, 1:253 440)



Map 15. Timmins West area

1. Card Lake antimony occurrence
2. Reeves mine
3. Penhorwood mine
4. Cryderman mine
5. Horwood Lake mine

Cryderman mine

BARITE, FLUORITE, CALCITE, QUARTZ, CHALCOPYRITE

In veins cutting granite

Finely granular white massive barite occurs with minor white fluorite, calcite, and milky quartz in veins filling fractures in granite. Traces of chalcopyrite are present.

Russell Cryderman discovered and staked the deposit in 1917. Original development work consisting of trenching and stripping was carried out by the Barite Syndicate. Barite was shipped from the deposit in 1923, 1933, and 1940. The workings consisted of five trenches extending over a distance of 244 m. In 1984, Extender Minerals Limited began underground development and drove a decline 610 m to a vertical depth of 61 m. In 1985-1986, barite ore was shipped to the company's mill in Matachewan.

The deposit is west of Tionaga Station (Canadian National Railway), about 150 km southwest of Timmins. See Map 15, No. 4, on page 176.

Road log from Timmins:

km		
	0	Timmins, at the junction of highways 101 and 629; proceed west along Highway 101.
	60.0	Junction, Kemogaming Road; proceed south along Kenogaming Road.
	66.5	Junction; follow the road on right leading west.
	83.5	Junction; proceed onto a road leading west.
	88.5	Cryderman mine.

Refs.: 68 p. 15-16; 116 p. 146; 116c p. 169; 128 p. 84-85.

Maps (T): 42 B/1 Foleyet
(G): 2231 Penhorwood and Kenogaming townships, Sudbury district (Ontario Geological Survey, 1:31 680)
2116 Chapleau-Foleyet, Algoma, Cochrane, and Sudbury districts (Ontario Geological Survey, 1:253 440)

Horwood Lake (Roseval Silica) mine

QUARTZ

In veins in volcanic rock

The veins consist of massive white quartz which is quarried for high purity silica. Horwood Lake Mining Company Limited opened the original quarry on a ridge of quartz about 100 m south of the railway, just east of a small lake, in 1964-1965. Roseval Silica Incorporated has made two additional openings since 1987.

One trench is on the road to the Cryderman barite mine; the other is 1.6 km west (on the south side of the railway) and about 200 m south of the original quarry. See Map 15, No. 5, on page 176.

Refs.: 116a p.218-219; 116e p. 229; 128 p. 88-89.

Maps (T): 42 B/1 Foleyet
(G): 2231 Penhorwood and Kenogaming townships, Sudbury district (Ontario Geological Survey, 1:31 680)
2116 Chapleau-Foleyet, Algoma, Cochrane, and Sudbury districts (Ontario Geological Survey, 1:253 440)

Reeves mine

CHRYSOTILE, PICROLITE, MAGNETITE, BRUCITE, PYROAURITE, ARAGONITE, DOLOMITE, TREMOLITE, TALC, PYRITE, CHALCOPYRITE, PYRRHOTITE, SOAPSTONE

In serpentinite

Light yellowish-green chrysotile asbestos occurs in veinlets averaging about 6 mm in width but reaching up to 8 cm. Light green to greenish-yellow picrolite and yellowish-green massive serpentine occur in the deposit. Magnetite is associated with the serpentine. Other minerals include brucite, as white to light green compact fibrous and flaky masses; pyroaurite, as light blue silky fibrous and foliated aggregates commonly associated with white sugary dolomite on serpentine; colourless to white tremolite; light green talc; and some pyrite, chalcopyrite, and pyrrhotite. Black soapstone occurs in the deposit.

The deposit was originally staked by J.C. Bromley. In 1952 and 1953, Canadian Johns-Manville Company Limited explored the deposit by geophysical surveys and diamond drilling. Investigations resumed in 1963 with the sinking of an exploration shaft, and were followed by removal of overburden in preparation for open pit mining. In 1966, Johns-Manville Mining and Trading Limited was incorporated to operate the mine, and production commenced in 1968. Operations came to an end in 1975.

The mine is located 1.3 km south of Highway 101 at a point 69.5 km west of the junction of highways 101 and 629 in Timmins. See Map 15, No. 2, on page 176.

Refs.: 77 p. 13; 128 p. 67-73; 211 p. 46-49.

Maps (T): 42 B/1 Foleyet
(G): 2230 Reeves and Sewell townships, Sudbury district (Ontario Geological Survey, 1:31 680)
2205 Timmins-Kirkland Lake sheet, Cochrane, Sudbury, and Timiskaming districts, Ontario (Ontario Geological Survey, 1:253 440)

Penhorwood mine

SOAPSTONE, MAGNESITE, SERPENTINE

In altered ultramafic rock

The soapstone is light grey to dark greyish green and is composed of talc with fracture fillings of magnesite. Serpentine is associated with the soapstone.

The deposit is worked for talc. Original development was done by Canadian Johns-Manville Company Limited in 1974. Steetley Talc Incorporated began mining from an open pit in 1978. Luzenac Incorporated has operated the mine since 1988. The talc is processed in a grinding plant in Timmins for use in the pulp and paper, paint and plastics industries.

The mine is south of the Reeves mine and about 75 km southwest of Timmins. A road, 3 km long, leads to it from Highway 101 at a point 69.5 km from the junction of highways 101 and 629 in Timmins. See Map 15, No. 3, on page 176.

Refs.: 58a p. 121-122; 116d p.240-241; 211a p.101.

Maps (T): 42 B/1 Foleyet

(G): 2231 Penhorwood and Kenogaming townships, Sudbury district (Ontario Geological Survey, 1:31 680)

2116 Chapleau-Foleyet, Algoma, Cochrane, and Sudbury districts (Ontario Geological Survey, 1:253 440)

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GLOSSARY

Acanthite. Ag_2S. H = 2-2.5. Iron-black metallic prismatic aggregates. Sectile. Low temperature form of silver sulphide, argentite being the high temperature form. Ore of silver associated with other silver minerals.

Acmite. Not a valid mineral name; renamed aegirine.

Actinolite. $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$. H = 5-6. Bright green to greyish-green columnar, fibrous, or radiating prismatic aggregates. Occurs in metamorphic rocks. Commonly associated with epidote. Monoclinic variety of amphibole.

Adularia. Transparent to translucent generally colourless variety of K-feldspar; may exhibit an opalescent effect, or schiller, as in moonstone. Occurs as pseudorhombohedra in low temperature hydrothermal veins in schists and gneisses.

Aegirine. $NaFeSi_2O_6$. H = 6. Dark green to almost black or greenish brown; prismatic, commonly elongated and striated crystals. Monoclinic variety of pyroxene.

Agate. Patterned and variously coloured variety of microcrystalline quartz (chalcedony). Translucent to opaque; colours are due to metallic oxide mineral impurities. Used as an ornamental stone.

Agglomerate. Rock formed by the consolidation of angular fragments ejected by volcanoes.

Agrellite. $NaCa_2Si_4O_{10}F$. H = 5.5. White, greyish, or greenish flat prismatic crystals with excellent cleavage; pearly lustre. Occurs in alkali rocks. Originally described from the Kipawa area, Quebec.

Akermanite. $Ca_2MgSi_2O_7$. H = 5. Colourless, greyish green, brown to black; generally massive. Vitreous to resinous lustre. Subconchoidal fracture. Not readily distinguished in the hand specimen from other members of group. Melilite group.

Aktashite. $Cu_6Hg_3As_4S_{12}$. Grey, metallic. Occurs as grains with other mercury sulphide minerals.

Alaskite. Granitic rock composed of microcline, orthoclase, and quartz with few or no dark minerals such as amphibole, biotite, or pyroxene.

Albertite. Hydrocarbon. H = 1-2. Black with brilliant lustre. Occurs in shale in Albert County, New Brunswick. Also known as albert coal. Name is derived from the locality.

Albite. $NaAlSi_3O_8$. H = 6. White tabular striated crystals, or cleavable masses. Vitreous lustre. Variety of plagioclase feldspar. Used in the manufacture of ceramics.

Allanite. $(Ce,Ca,Y)_2(Al,Fe)_3(SiO_4)_3(OH)$. H = 6.5. Black or dark brown tabular aggregates, or massive with conchoidal fracture. Vitreous or pitchy lustre. Generally occurs in granitic rocks, in pegmatites, and is commonly surrounded by an orange halo. Distinguished by its weak radioactivity.

Allargentum. $Ag_{1-x}Sb_x$. Grey metallic grains occurring in native silver or as veinlets in calcite containing high grade silver ore.

Allemontite. A mixture of stibarsen and arsenic or antimony. Not a valid mineral species.

Alloclasite. (Co,Fe)AsS. Light grey, metallic; compact radiating crystal aggregates. Occurs in cobalt deposits.

Allophane. Amorphous hydrous aluminosilicate. H = 3. Light blue, green, brown, yellow, or colourless encrustations or powdery masses, also stalactitic or mammillary. Vitreous to waxy. Decomposition product of aluminous silicates such as feldspar. Not a valid mineral species.

Alluaudite. $(Na,Ca)Fe(Mn,Fe,Mg)_2(PO_4)_3$. H = 5-5.5. Yellow to brownish-yellow massive granular or compact radiating fibrous aggregates. Generally opaque. Occurs as an alteration of varulite-hühnerkobelite in pegmatites.

Almandine. $Fe_3Al_2(SiO_4)_3$. H = 7-7.5. Dark red transparent to opaque dodecahedral or trapezohedral crystals; also massive. Generally occurs in mica schists or gneisses; also in granites and pegmatites. Used as an abrasive (sand paper); transparent variety used as a gemstone. Garnet group.

Altaite. PbTe. H = 3. Light grey, metallic, with bronze tarnish. Generally massive but may occur as cubic or cubo-octahedral crystals. Sectile with perfect cleavage. Occurs with native gold and with other tellurides and sulphides in vein deposits.

Alunogen. $Al_2(SO_4)_3 \cdot 17H_2O$. H = 1.5-2. White fibrous crusts; powdery. Vitreous to silky lustre. Acid, sharp taste. Secondary mineral associated with pyrite or marcasite.

Amazonite. $KAlSi_3O_8$. H = 6. Green variety of microcline feldspar. Colour is due to natural irradiation of microcline containing Pb and H_2O. Occurs in pegmatite. Used as a gemstone and for ornamental purposes.

Amethyst. Violet variety of quartz. Colour is due to natural irradiation of quartz containing Fe. Generally occurs in igneous and volcanic rocks. Transparent variety is used as a gemstone.

Amphibole. A mineral group consisting of complex silicates including tremolite, actinolite, and hornblende. Common rock-forming mineral.

Amphibolite. A metamorphic rock composed essentially of amphibole and plagioclase.

Amygdaloidal lava. Fine grained lava (basalt) with cavities (amygdules) that may be filled with quartz, calcite, chlorite, zeolites, etc.

Analcime (Analcite). $NaAlSi_2O_6 \cdot H_2O$. H = 5-5.5. Colourless, white, yellowish, or greenish vitreous, transparent, trapezohedral crystals, or massive granular. Distinguished from garnet by its inferior hardness. Often associated with other zeolites.

Anatase. TiO_2. H = 5.5-6. Yellowish or reddish-brown pyramidal or tabular crystals with adamantine lustre; also grey or blue. Massive. Also known as octahedrite.

Ancylite. $SrCe(CO_3)_2(OH) \cdot H_2O$. H = 4-4.5. Light yellow, yellowish-brown, or grey translucent prismatic crystals or rounded cyrstal aggregates. Splintery fracture. Soluble in acids. Rare mineral.

Andalusite. Al_2SiO_5. H = 7.5. White, grey, rose red, or brown prismatic crystals with almost square cross-section. Vitreous to dull lustre. Transparent to opaque. Chiastolite variety has carbonaceous inclusions arranged in crossed lines which are evident in cross-section. Occurs in metamorphosed shales. Used in the manufacture of mullite refractories, spark plugs; transparent variety used as a gemstone.

Andesite. A dark-coloured volcanic rock composed mainly of plagioclase feldspar with amphibole or pyroxene.

Andorite. $PbAgSb_3S_6$. H = 3-3.5. Dark grey metallic striated prismatic or tabular crystals; massive. Conchoidal fracture. Black streak. Soluble in HCl. Associated with sulphides and other sulphosalts.

Andradite. $Ca_3Fe_2(SiO_4)_3$. H = 7. Yellow, green, brown, black dodecahedral or trapezohedral crystals; massive. Occurs in chlorite schist, serpentinite, crystalline limestone. Gem varieties are demantoid (green), topazolite (yellow), and melanite (black). Garnet group.

Anglesite. $PbSO_4$. H = 2.5-3. Colourless to white, greyish, yellowish, or bluish tabular or prismatic crystals, or granular. Adamantine to resinous lustre. Characterized by high specific gravity (6.37) and adamantine lustre. Effervesces in HNO_3. Secondary mineral, generally formed from galena. Ore of lead.

Anhydrite. $CaSO_4$. H = 3-3.5. White, bluish, or greyish with vitreous lustre. Generally granular massive. Alters to gypsum by absorption of water. Distinguished from gypsum by its superior hardness. Used as a soil conditioner and in portland cement.

Ankerite. $Ca(Fe,Mg,Mn)(CO_3)_2$. Variety of dolomite from which it cannot be distinguished in the hand specimen.

Annabergite. $Ni_3(AsO_4)_2{\bullet}8H_2O$. H = 1.5-2.5. Light green finely crystalline or earthy encrustations. Soluble in acids. Secondary mineral formed by oxidation of cobalt and nickel arsenides. Colour and association with nickel minerals are distinguishing characteristics. Referred to as nickel bloom.

Anorthite. $CaAl_2Si_2O_8$. H = 6. White or greyish cleavable masses; prismatic, striated crystals. Plagioclase feldspar.

Anorthoclase. $(Na,K)AlSi_3O_8$. H = 6-6.5. Colourless, white with reddish, greenish, or yellowish tint. May exhibit polysynthetic twinning. Occurs in volcanic and other igneous rocks. Feldspar group.

Anorthosite. An igneous rock composed almost entirely of plagioclase.

Anthophyllite. $(Mg,Fe)_7Si_8O_{22}(OH)_2$. H = 6. White, light grey to brown fibrous or prismatic aggregates with vitreous or silky lustre. Distinguished from tremolite by its fibrous habit and silky lustre. Fibrous variety resembles asbestos but is more brittle. Used in asbestos cement, for boiler coverings and fireproof paints because of its resistance to heat. Orthorhombic variety of amphibole.

Anthraxolite. Hydrocarbon. H = 3-4. Black, massive. Submetallic to pitchy lustre. Uneven to conchoidal fracture. Friable, combustible. Exposed surface partly altered to orange powder.

Antigorite. $Mg_3Si_2O_5(OH)_4$. H = 2.5. Green translucent variety of serpentine with lamellar structure.

Antimony. Sb. H = 3-3.5. Light grey, metallic, cleavable, massive, also radiating or botryoidal. Perfect cleavage. Occurs in hydrothermal veins with silver, antimony, and arsenic ores. Minor source of antimony for use in alloys of lead and tin, and for flame-proofing textiles, paints, and ceramics.

Antiperthite. Lamellar intergrowth of potassium and sodium feldspars in which sodium feldspar is dominant.

Antlerite. $Cu_3SO_4(OH)_4$. H = 3.5. Emerald-green to dark green tabular, prismatic, or acicular microscopic crystals. Vitreous lustre. Secondary mineral occurring in copper deposits. Ore of copper.

Apatite. $Ca_5(PO_4)_3(F,Cl,OH)$. H = 5. Green to blue, colourless, brown, or red hexagonal crystals or granular to sugary massive. Vitreous lustre. May be fluorescent. Distinguished from beryl and quartz by its inferior hardness; massive variety is distinguished from calcite and dolomite by lack of effervescence in HCl, and from diopside and olivine by its inferior hardness. Used in the manufacture of fertilizers and in the production of detergents. Apatite is a mineral group that includes the species fluorapatite, chlorapatite, hydroxylapatite, carbonate-fluorapatite.

Aplite. A light-coloured igneous (dyke) rock with fine grained granitic texture and composition similar to granite.

Aplowite. $(Co,Mn,Ni)SO_4•4H_2O$. H = 3. Pink, powdery, with vitreous lustre and white streak. Occurs as coatings on barite-siderite-sulphide specimens. Soluble in water. Originally described from the Magnet Cove barite mine, Walton, Nova Scotia, and named in honour of A.P. Low, director of the Geological Survey of Canada (1906-1907).

Apophyllite. $KCa_4(Si_4O_{10})_2(F,OH)•8H_2O$. H = 5. Colourless, grey, white, green, yellow, or less commonly, pink square prismatic or pyramidal crystals with pearly or vitreous lustre. Perfect basal cleavage and pearly lustre on cleavage face are diagnostic. Commonly associated with zeolites in basalt.

Aragonite. $CaCO_3$. H = 3.5-4. Colourless to white or grey and, less commonly, yellow, blue, green, violet, or rose-red prismatic or acicular crystals; also columnar, globular, or stalactitic aggregates. Vitreous lustre. Transparent to translucent. Distinguished from calcite by its cleavage, superior hardness, and higher specific gravity (2.93). Effervesces in dilute HCl. Pearly inner surfaces of sea shells and pearls are composed of aragonite.

Arfvedsonite. $Na_3(Fe,Mg)_4FeSi_8O_{22}(OH)_2$. H = 5-6. Greenish-black to black tabular or long prismatic crystals. Vitreous lustre. Occurs in alkalic igneous rocks. Monoclinic variety of amphibole.

Argentite. Ag_2S. H = 2-2.5. Dark grey metallic cubic or octahedral crystals; arborescent, massive. Very sectile. Occurs in sulphide deposits with other silver minerals. Inverts to acanthite at temperatures below 180°C.

Argillite. A clayey sedimentary rock without slaty cleavage or shaly fracture.

Arizonite. $Fe_2Ti_3O_9$. H = 3.5. Brown to black, platy or granular. Opaque; submetallic lustre. Reddish brown streak. Alteration product of ilmenite.

Arkose. A sandstone in which feldspar grains predominate over quartz.

Armenite. $BaCa_2Al_6Si_9O_{30}.2H_2O$. H = 7.5. Colourless, white, or greyish-green prismatic crystals. Vitreous lustre. Associated with axinite, zoisite.

Arsenic. As. H = 3.5. Light grey to black, submetallic. Massive, reniform, or stalactitic. Volatile without fusion, giving off garlic odour. Occurs in veins with silver, cobalt, and nickel ores.

Arsenolite. As_2O_3. H = 1.5. White botryoidal, stalactitic, earthy encrustations. Vitreous to silky lustre. Sweetish astringent taste. Secondary mineral formed by oxidation of arsenopyrite, smaltite, and other arsenic minerals.

Arsenopyrite. FeAsS. H = 5.5-6. Light grey to dark grey metallic striated prisms with characteristic wedge-shaped cross-section; also massive. Tarnishes to bronze colour. Ore of arsenic; may contain gold or silver.

Artinite. $Mg_2(CO_3)(OH)_2 \cdot 3H_2O$. H = 2.5. White acicular crystals; fibrous aggregates forming botryoidal, spherical masses and cross-fibre veinlets. Transparent with vitreous, silky, or satin lustre. Occurs in serpentine. Distinguished from calcite by its form and lustre.

Asbestos. Fibrous variety of certain silicate minerals such as serpentine (chrysotile) and amphibole (anthophyllite, tremolite, actinolite, crocidolite) characterized by flexible, heat- and electrical-resistant fibres. Chrysotile is the only variety produced in Canada; it occurs as veins with fibres parallel (slip fibre) or perpendicular (crossfibre) to the vein walls. Used in the manufacture of asbestos cement sheeting, shingles, roofing, and floor tiles, millboard, thermal insulating paper, pipe covering, clutch and brake components, reinforcing in plastics, etc.

Asbolite. A mixture of manganese oxides (wad) containing cobalt oxide with or without oxides of nickel and copper. Occurs as dull-black earthy or compact masses.

Ashcroftine. $K_9Na_9(Y,Ca)_{12}Si_{28}O_{70}(OH)_2(CO_3)_8 \cdot 3H_2O$. Pink fibrous, prismatic, or powdery aggregates. Occurs in alkalic igneous rocks.

Asterism. Intersecting lines or bands of light forming a star, as seen in transmitted light in mica, or in reflected light in cabochon-cut sapphire, garnet, etc. Caused by light reflected from microscopic inclusions arranged along crystallographic directions.

Astrophyllite. $(K,Na)_3(Fe,Mn)_7Ti_2Si_3O_{24}(O,OH)_7$. H = 3. Golden-yellow to bronze-brown elongated crystals or blades, often radiating; also micaceous with pearly or splendent lustre. More brittle than mica. Generally occurs in nepheline syenite.

Atacamite. $Cu_2Cl(OH)_3$. H = 3-3.5. Green prismatic, tabular aggregates; granular massive, fibrous. Adamantine to vitreous lustre. Soluble in acids. Associated with other secondary copper minerals.

Augite. $(Ca,Na)(Mg,Fe,Al,Ti)(Si,Al)_2O_6$. Dark green to black. Important constituent of basic and ultrabasic rocks. Monoclinic variety of pyroxene.

Augite syenite. A relatively coarse-textured igneous rock composed mainly of feldspar and pyroxene (augite) with little or no quartz. Used as a building stone.

Aurichalcite. $(Zn,Cu)_5(CO_3)_2(OH)_6$. H = 1-2. Light green or blue silky to pearly acicular or lath-like crystals forming tufted, feathery, plumose, laminated, or granular encrustations. Transparent. Soluble in acids and in ammonia. Secondary mineral occurring in oxidized zones of copper and zinc deposits, associated with other secondary copper and zinc minerals.

Aurostibite. $AuSb_2$. H = 3. Dark grey, metallic. Occurs as grains with gold and sulphide minerals. Resembles galena. Not readily identified in hand specimen.

Axinite. $(Ca,Mn,Fe,Mg)_3Al_2BSi_4O_{15}(OH)$. H = 7. Violet, pink, yellow to brown wedge-shaped crystals or massive, lamellar. Vitreous lustre. Fuses readily with intumescence. Occurs commonly in contact-altered calcareous rocks. Transparent varieties are used as gemstones.

Azurite. $Cu_3(CO_3)_2(OH)_2$. H = 3.5-4. Azure-blue to inky-blue tabular or prismatic crystals; also massive, earthy, stalactitic with radial or columnar structure. Vitreous lustre; transparent. Secondary copper mineral. Effervesces in acids. Ore of copper.

Baddeleyite. ZrO_2. H = 6.5. Cream white, yellowish, or amber scaly, finely granular, powdery aggregates. Greasy to dull lustre. Associated with fluorite, dawsonite at the Francon Quarry, Montreal.

Barite. $BaSO_4$. H = 3-3.5. White, pink, yellowish, or blue tabular or prismatic crystals; granular massive. Vitreous lustre. Characterized by high specific gravity (4.5) and perfect cleavage. Used in glass, paint, rubber, and chemical industries, and in oil-drilling technology.

Barylite. $BaBe_2Si_2O_7$. H = 7. Colourless, white, or bluish tabular, prismatic crystals, or massive. Transparent, vitreous. Perfect cleavage.

Basalt. Dark, fine grained volcanic rock or lava composed predominantly of an amphibole or a pyroxene with plagioclase. Amygdaloidal basalt contains cavities that may be hollow or occupied by one or more minerals.

Basaluminite. $Al_4(SO_4)(OH)_{10}{\bullet}5H_2O$. White, powdery to compact, massive. Dull lustre. Conchoidal fracture. Secondary mineral, associated with gypsum, aragonite.

Bassanite. $2CaSO_4{\bullet}H_2O$. White microscopic prisms, fibres, plates. Silky to dull lustre. Associated with gypsum on which it may form chalky coatings. Dehydration product of gypsum; also occurs in volcanic rocks.

Bastnaesite. $(La,Ce)(CO_3)F$. H = 4-4.5. Yellowish to reddish-brown and grey platy, lath-shaped, or granular masses with dull, greasy, or pearly lustre; also greenish brown, earthy. Occurs with other rare-element minerals. Soluble in HCl. Difficult to identify in hand specimen.

Batholith. A very large body of coarse-textured igneous rocks such as granite or diorite.

Baumhauerite. $Pb_3As_4S_9$. H = 3. Grey metallic striated prismatic or tabular crystals. Brown streak. Occurs with other lead sulphosalt minerals.

Bavenite. $Ca_4Be_2Al_2Si_9O_{26}(OH)_2$. H = 5.5. White; greenish-, pinkish-, or brownish-white prismatic crystals; also fibrous or radiating lamellar aggregates. Vitreous lustre. Associated with beryl in granite pegmatites.

Behoite. $Be(OH)_2$. H = 4. Colourless, white pseudo-octahedral crystals. Vitreous lustre. Occurs in granitic pegmatite and in syenite.

Berthierite. $FeSb_2S_4$. H = 2-3. Dark steel-grey metallic striated prismatic crystals; fibrous or granular masses. Tarnished surface is iridescent or brown. Generally associated with stibnite and not readily distinguished from it in hand specimen.

Bertrandite. $Be_4Si_2O_7(OH)_2$. H = 6-7. Colourless or light yellow tabular or prismatic crystals. Vitreous or pearly lustre. Associated with beryl in granite pegmatites.

Beryl. $Be_3Al_2Si_6O_{18}$. H = 8. White, yellow, green, or blue, hexagonal prisms, or massive with conchoidal or uneven fracture. Vitreous lustre; transparent to translucent. Distinguished from apatite by superior hardness, from topaz by its lack of perfect cleavage; massive variety distinguished from quartz by its higher density. Ore of beryllium with numerous uses in

nuclear energy, space, aircraft, electronic, and scientific equipment industries; used as alloying agent with copper, nickel, iron, aluminum, and magnesium. Gem varieties include emerald and aquamarine.

Betafite. $(Ca,Na,U)_2(Ti,Nb,Ta)_2O_6(OH)$. H = 4-5.5. Brown to black waxy to submetallic octahedral or modified octahedral crystals. Metamict. Occurs with euxenite, fergusonite, cyrtolite in granite pegmatites and in calcite veins.

Beta-uranophane. $(H_3O)_2Ca(UO_2)_2(SiO_4)_2 \cdot 3H_2O$. H = 2.5-3. Yellow to yellowish-green aggregates of acicular crystals or short prismatic crystals. Silky to waxy lustre. May fluoresce green in ultraviolet light. Secondary mineral occurring in granitic rocks and calcite veins containing uranium minerals.

Beudantite. $PbFe_3(AsO_4)(SO_4)(OH)_6$. H = 3.5-4.5. Dark green, brown, or black rhombohedral crystals; also yellow earthy or botryoidal masses. Vitreous, resinous to dull lustre. Secondary mineral occurring in iron and lead deposits. Difficult to distinguish in hand specimens from other yellowish secondary minerals.

Beyerite. $(Ca,Pb)Bi_2(CO_3)_2O_2$. H = 2-3. White, yellow, greenish, yellow to green or grey platy, tabular crystals, or earthy. Vitreous to dull lustre. Occurs as encrustations, or fillings in cavities and fractures. Secondary mineral formed from bismuth minerals.

Bindheimite. $Pb_2Sb_2O_6(O,OH)$. H = 4-4.5. Yellow to brown, white to grey or greenish powdery to earthy encrustations; also nodular. Secondary mineral found in antimony-lead deposits. Difficult to identify except by X-ray methods.

Biomicrite. Limestone composed of skeletal fossil debris and carbonate mud (micrite). Described by major fossil type present, eg. crinoid biomicrite.

Biotite. $K(Mg,Fe)_3(Al,Fe)Si_3O_{10}(OH,F)_2$. H = 2.5-3. Dark brown or greenish-black transparent hexagonal platy crystals; platy or scaly aggregates. Splendent lustre. Occurs in pegmatites, calcite veins, pyroxenite. Constituent of igneous rocks (granite, syenite, diorite, etc.) and metamorphic rocks (gneiss, schist). Elasticity of individual plates or sheets distinguishes it from chlorite. Sheet mica is used as electrical insulators and for furnace and stove doors (isinglass); ground mica is used in the manufacture of roofing materials, wallpaper, lubricants, and fireproofing material. Mica group.

Birnessite. $Na_4Mn_{14}O_{27} \cdot 9H_2O$. H = 1.5. Black opaque grains, granular aggregates, earthy. Dull lustre. Secondary mineral associated with other manganese minerals. Difficult to identify except by X-ray methods.

Bismoclite. BiOCl. H = 2-2.5. Cream white to grey, brownish; greasy to silky, or dull lustre. Massive, earthy, columnar, fibrous, or scaly. Soluble in acids. Secondary mineral formed by alteration of bismuthinite or native bismuth.

Bismuth. Bi. H = 2-2.5. Light grey metallic reticulated crystal aggregates; also foliated or granular. Iridescent tarnish. Used as a component of low melting-point alloys and in medicinal and cosmetic preparations.

Bismuthinite. Bi_2S_3. H = 2. Dark grey striated prismatic acicular crystals; also massive. Iridescent on tarnished surface. Ore of bismuth.

Bismutite. $Bi_2(CO_3)O_2$. H = 2.5-3.5. Yellowish-white to brownish-yellow, light green, or grey earthy or pulverulent masses; also fibrous crusts, spheroidal aggregates, scaly or lamellar. Dull, vitreous, or pearly lustre. Effervesces in HCl. Uncommon secondary mineral formed by alteration of bismuth minerals.

Bitumen. Natural mixture of hydrocarbons which may be liquid (petroleum) or solid (asphalt or mineral pitch).

Bityite. $CaLiAl_2(AlBeSi_2)O_{10}(OH)_2$. H = 5.5. White, yellow, or brownish-white transparent tabular pseudohexagonal crystals, or micaceous. Associated with lithium minerals in granite pegmatites.

"Black diamond". A siliceous hematite which, when polished, takes a high, mirror-like lustre. Used as a gemstone.

Boehmite. AlO(OH). H = 3. White with pearly to silky lustre. Flaky, fibrous, granular, or powdery aggregates; also pisolitic. Associated with other aluminum minerals.

Bog iron ore. Loose porous iron ore formed by precipitation of water in bogs or swampy areas. Ore consists of limonite, goethite, and/or hematite.

Bohdanowiczite. $AgBiSe_2$. H = 3. Dark grey metallic microscopic grains associated with other selenides and with sulphides.

Boltwoodite. $(H_3O)K(UO_2)(SiO_4)$. H = 3.5-4. Light yellow acicular fibrous aggregates. Silky, vitreous to dull lustre. Fluoresces dull green in ultraviolet light. Secondary mineral formed from uranium minerals.

Boracite. $Mg_3B_7O_{13}Cl$. H = 7-7.5. Colourless, white, yellow, green, or grey cubic or dodecahedral crystals; fibrous or granular aggregates. Transparent with vitreous lustre. Occurs in gypsum, halite, and potash deposits. Soluble in HCl.

Bornite. Cu_5FeS_4. H = 3. Reddish brown, metallic. Usually massive. Tarnishes to iridescent blue, purple, etc. Ore of copper. Also known as peacock ore, variegated copper, vitreous copper, and purple copper ore.

Botallackite. $Cu_2Cl(OH)_3$. Light green to bluish-green columnar crystals forming crusts. Secondary mineral associated with other copper minerals.

Boulangerite. $Pb_5Sb_4S_{11}$. H = 2.5-3. Dark bluish grey, metallic; striated, elongated prismatic to acicular crystals; also fibrous, plumose aggregates. Fibrous cleavage is distinguishing characteristic. Ore of antimony.

Bournonite. $PbCuSbS_3$. H = 2.5-3. Grey to blackish grey, metallic. Short prismatic or tabular crystals with striations; massive. Occurs in veins with sulphides and sulphosalts. Not readily identified in the hand specimen.

Brannerite. $(U,Ca,Y,Ce)(Ti,Fe)_2O_6$. H = 4.5. Black opaque grains, prismatic crystals, granular masses. Resinous to dull lustre. Brownish yellow on weathered surfaces. Conchoidal fracture. Radioactive. Ore of uranium.

Bravoite. $(Ni,Fe)S_2$. Yellow to grey, metallic, with violet tinge. Member of the pyrite group. Resembles pyrite except for colour.

Breccia. A rock composed of angular fragments; may be attractively patterned and coloured and used as an ornamental rock.

Breithauptite. NiSb. H = 5.5. Light copper red with violet tint. Metallic lustre. Occurs as disseminated grains, massive, arborescent, and rarely as tabular or prismatic crystals. Reddish-brown streak. Associated with silver and nickel minerals in vein deposits.

Breunnerite. A variety of magnesite containing iron. White, yellowish to brownish white.

Britholite. $(Y,Ce,Ca)_5(SiO_4,PO_4)_3(OH,F)$. Tan to brown prisms, platy aggregates, and massive. Resinous lustre. Difficult to distinguish in the hand specimen.

Brochantite. $Cu_4(SO_4)(OH)_6$. H = 3.5-4. Green acicular crystal aggregates; massive, granular. Vitreous lustre. Secondary mineral formed by oxidation of copper minerals. Distinguished from malachite by lack of effervescence in HCl.

Brookite. TiO_2. H = 5.5-6. Dark brown to black tabular or pyramidal crystals with metallic, adamantine lustre. Not readily identifiable in the hand specimen.

Brucite. $Mg(OH)_2$. H = 2.5. White, grey, light blue, or green tabular, platy, foliated, or fibrous aggregates, also massive. Pearly or waxy lustre. Soluble in HCl. Distinguished from gypsum and talc by its superior hardness and lack of greasy feel. Resembles asbestos but lacks silky lustre. More brittle than muscovite. Used for refractories and as a minor source of magnesium metal.

Brugnatellite. $Mg_6Fe(CO_3)(OH)_{13}{\bullet}4H_2O$. H = 2. White silky, pearly, or waxy; flaky, aggregates, or foliated lamellar nodules; may be tinted reddish, yellowish, brownish. Associated with brucite and serpentine.

Burbankite. $(Na,Ca)_3(Sr,Ba,Ce)_3(CO_3)_5$. H = 3.5. Tiny yellow or greyish-yellow hexagonal crystals, massive; also colourless to reddish-pink fine hair-like aggregates in cavities with calcite. Associated with other rare-element minerals. Effervesces in HCl. Not readily identifiable in the hand specimen.

Cabochon. A polished gemstone having a convex surface; translucent or opaque minerals such as opal, agate, jasper, and jade are generally cut in this style.

Cadmoselite. CdSe. H = 4. Black microscopic grains with resinous to adamantine lustre. Rare mineral associated with other selenium and cadmiun minerals.

Cafarsite. $Ca_8(Ti,Fe,Mn)_{6-7}(AsO_3)_{12}{\bullet}4H_2O$. Dark brown cubic, octahedral, or dodecahedral crystals. Opaque. Conchoidal fracture. Yellowish-brown streak.

Calaverite. $AuTe_2$. H = 2.5-3. Brass yellow to silver white, metallic, bladed, lath-like, or striated short prismatic crystals. Fuses readily; on charcoal, gives bluish-green flame and gold globules. Ore of gold. Occurs in veins with pyrite, native gold.

Calcite. $CaCO_3$. H = 3. Colourless or white rhombohedral, scalenohedral crystals; cleavable, granular massive. May be variously coloured due to impurities. Transparent to opaque. Vitreous, pearly, or dull lustre. May fluoresce in ultraviolet light. Effervesces in dilute HCl. Distinguished from dolomite by its inferior hardness and superior solubility in HCl. Major constituent of chalk and limestone.

Cancrinite. $Na_6Ca_2Al_6O_{24}(CO_3)_2$. H = 6. Yellow, pink, or grey massive or prismatic crystals; vitreous to greasy lustre. Effervesces in warm HCl. Associated with nepheline and sodalite in nepheline syenite.

Carbonate-cyanotrichite. $Cu_4Al_2(CO_3,SO_4)(OH)_{12} \cdot 2H_2O$. H = 2. Light blue to medium blue finely granular encrustations with vitreous lustre; also silky fibrous. Secondary mineral formed from copper minerals and associated with other secondary copper minerals. Dissolves in HCl.

Carbonatite. Carbonate rock formed by the reaction of basic magma with limestone and dolomite.

Carletonite. $KNa_4Ca_4Si_8O_{18}(CO_3)_4(F,OH) \cdot H_2O$. H = 4-4.5. Colourless, pink, or light blue flakes. Transparent to translucent; vitreous to pearly. Originally described from Mont Saint-Hilaire, Quebec, where it is associated with pectolite, albite, arfvedsonite, calcite, fluorite, and apophyllite. Named in honour of Carleton University where this and several other new species have been identified.

Carnallite. $KMgCl_3.6H_2O$. H = 2.5. Colourless to white tabular crystals, or granular massive. Greasy or dull lustre. Deliquescent and soluble in water. Bitter taste. Occurs with halite and sylvite.

Carnelian. Red to reddish-brown or reddish-yellow translucent variety of chalcedony. Used as a gemstone.

Carrollite. $Cu(Co,Ni)_2S_4$. H = 4.5-5.5. Grey, metallic; tarnishes to copper red or violet grey. Granular massive; octahedral crystals. Occurs with other sulphide minerals in vein deposits.

Cassiterite. SnO_2. H = 6-7. Yellow to brown prismatic crystals; twinning common. Also radially fibrous, botryoidal, or concretionary masses; granular. Adamantine to splendent lustre. White to brownish or greyish streak. Distinguished from other light-coloured nonmetallic minerals by its high specific gravity (6.99), from wolframite by its superior hardness. Ore of tin. Concentrically banded variety is used as a gemstone. Occurs with gold in placers in Yukon Territory.

Catapleiite. $Na_2ZrSi_3O_9 \cdot 2H_2O$. H = 6. Light yellow, tan, yellowish-brown, or colourless hexagonal plates with vitreous to greasy lustre. Occurs in nepheline syenite where it can be distinguished by its platy habit.

Cattierite. CoS_2. H = 4. Pinkish metallic granular intergrowths with other sulphide minerals; cubic crystals to 1 cm across.

Caysichite. $Ca,GdY_4Si_8O_{20}(CO_3)_6(OH) \cdot 2H_2O$. Colourless, white, yellow, or green coatings or encrustations with divergent columnar structure. Associated with other yttrium minerals. Originally described from the Evans-Lou mine near Wakefield, Quebec. Named for the elements Ca, Y, Si, C, H.

Celadonite. $K(Mg,Fe)(Fe,Al)Si_4O_{10}(OH)_2$. H = 2. Bluish-green to greyish-green scaly, fibrous, or earthy compact masses. Occurs in basalt with zeolites and quartz. Mica group.

Celestite. $SrSO_4$. H = 3-3.5. Transparent, colourless, white, or light blue tabular crystals; also fibrous, massive. Vitreous lustre. Perfect cleavage. Flame test produces crimson colour. Resembles barite but not as heavy. Ore of strontium.

Cement rock. See waterlime.

Cenosite. See kainosite.

Cernyite. Cu_2CdSnS_4. H = 4. Steel grey, metallic. Occurs as rare grains in pegmatite at the type locality, the Bernic Lake (Tanco) mine, in Manitoba. Named in honour of Professor Petr Cerny, University of Manitoba.

Cerussite. $PbCO_3$. H = 3-3.5. Transparent white, grey, or brownish tabular crystals with adamantine lustre; also massive. High specific gravity (6.5) and lustre are distinguishing features. Secondary mineral formed by oxidation of lead minerals. Fluoresces yellow in ultraviolet light. Soluble in dilute HNO_3. Ore of lead.

Cervantite. Sb_2O_4. H = 4-5. Yellow to yellowish-white powdery or fibrous crust. Greasy, pearly, or earthy lustre. Secondary mineral formed by oxidation of antimony minerals.

Chabazite. $CaAl_2Si_4O_{12}{\bullet}6H_2O$. H = 4. Square colourless, white, yellowish, or pinkish crystals. Vitreous lustre. Occurs in cavities in basalt. Distinguished from other zeolites by its almost cubic crystal form, from calcite by its superior hardness and its lack of effervescence in HCl.

Chalcanthite. $CuSO_4{\bullet}5H_2O$. H = 2.5. Light to dark blue tabular or short prismatic crystals; massive, granular. Vitreous lustre. Metallic taste. Secondary mineral formed in copper sulphide deposits. Distinguished from azurite by lack of effervescence in HCl.

Chalcedony. SiO_2. H = 7. Translucent microcrystalline variety of quartz. Colourless, grey, bluish, yellowish, reddish, brown. Formed from aqueous solutions. Attractively coloured chalcedony is used for ornamental objects and jewellery. Varieties include agate, carnelian, jasper, etc.

Chalcoalumite. $CuAl_4(SO_4)(OH)_{12}{\bullet}3H_2O$. H = 2.5. Light blue, bluish-green, or bluish-grey transparent to translucent platy, fibrous aggregates. Vitreous to dull lustre. Secondary mineral associated with copper minerals.

Chalcocite. Cu_2S. H = 3.5-4. Dark grey to black, metallic; massive. Tarnishes to iridescent blue, purple, etc. Also referred to as vitreous copper, sulphurette of copper, and copper glance. Soluble in HNO_3. Black colour and slight sectility distinguish it from other copper sulphides. Ore of copper.

Chalcopyrite. $CuFeS_2$. H = 3.5-4. Brass yellow, massive, or as tetrahedral crystals. Iridescent tarnish. Brass colour distinguishes it from pyrrhotite. Distinguished from pyrite by its inferior hardness, from gold by its superior hardness and lower density. Also called copper pyrite and yellow copper. Ore of copper.

Chalcostibite. $CuSbS_2$. H = 3-4. Dark grey metallic blade-like crystals, or massive. Associated with copper and antimony minerals.

Chamosite. $(Fe,Mg)_5Al(Si_3Al)O_{10}(O,OH)_8$. H = 3. Yellowish to dull-green or grey earthy or clay-like masses. Occurs in some sedimentary iron deposits. Chlorite group.

Chapmanite. $SbFe_2(SiO_4)_2(OH)$. H = 2. Yellowish-green lath-shaped crystals; powdery. Alteration product of silver-antimony minerals. Associated with native silver. Originally described from the Keeley mine, Cobalt district, Ontario. Named in honour of Edward J. Chapman, professor of mineralogy (1853-1895), University of Toronto.

Chert. SiO_2. H = 7. Massive opaque variety of chalcedony; generally drab colours: various tints of grey or brown.

Chloanthite. $(Ni,Co)As_3$. Member of the skutterudite series, high in nickel. Not distinguishable in hand specimen from other members of the series – smaltite and skutterudite in which the cobalt-nickel content is variable. Variety of nickel-skutterudite; not a valid mineral name.

Chlorite. $(Mg,Fe,Al)_6(Al,Si)_4O_{10}(OH)_8$. H = 2-2.5. Transparent green flaky aggregates. Distinguished from mica by its colour and by its flexible but nonelastic flakes. Occurs in metamoprhic, igneous, and volcanic rocks. Alteration product of amphibole, pyroxene, biotite.

Chloritoid. $(Fe,Mg,Mn)_2Al_4Si_2O_{10}(OH)_4$. H = 6.5. Dark grey to black tabular crystals; also platy, scaly, foliated aggregates and massive. Translucent. Pearly lustre. Occurs in schists, lava.

Chlorophane. A variety of fluorite that phosphoresces bright green when heated. Not a valid mineral name.

Chondrodite. $(Mg,Fe)_5(SiO_4)_2(F,OH)_2$. H = 6-6.5. Orange-yellow grains and granular masses. Vitreous to slightly resinous lustre. Subconchoidal to uneven fracture. Occurs in crystalline limestone and in skarn deposits. Orange colour is distinguishing feature. Distinguished from tourmaline by its inferior hardness, from apatite by its superior hardness. Member of humite group.

Chrome mica. Green chromium-bearing mica. Also known as fuchsite.

Chromite. $FeCr_2O_4$. H = 5.5. Black metallic octahedral crystals (rare); generally massive. Distinguished from magnetite by its brown streak and weak magnetism. Commonly associated with serpentine. Ore of chromium.

Chrysoberyl. $BeAl_2O_4$. H = 8.5. Yellow, green, or brown tabular or short prismatic crystals commonly striated and twinned forming six broad radiating spokes. Vitreous; transparent to opaque. Transparent variety is used as a gemstone. Other gem varieties include alexandrite, which is green in natural light and red in artifical light, and cat's-eye, which exhibits a movable streak of light when cut in the cabochon style. Occurs in pegmatites and in mica schist.

Chrysocolla. $(Cu,Al)_2H_2(Si_2O_5)(OH)_4{\bullet}nH_2O$. H = 2-4. Blue to blue green, earthy, botryoidal, or fine grained massive. Conchoidal fracture. Secondary mineral found in oxidized zones of copper-bearing veins. Often intimately mixed with quartz or chalcedony, producing attractive patterns; being mixed with these minerals gives chrysocolla a superior hardness that renders it suitable for use in jewellery and ornamental objects. Minor ore of copper.

Chrysotile. Fibrous variety of serpentine (asbestos).

Cinnabar. HgS. H = 2-2.5. Orange-red to brownish-red, dark grey rhombohedral, tabular, or prismatic crystals; also granular to earthy massive. Adamantine, metallic, or dull lustre. Opaque. Perfect cleavage. Occurs in veins formed at low temperatures. Commonly associated with pyrite, marcasite, and stibnite in silica-carbonate gangue. Ore of mercury.

Clausthalite. PbSe. H = 2.5-3. Dark grey metallic with bluish tint. Granular massive, foliated. Associated with other selenides in ore deposits.

Cleavelandite. Platy, tabular, or lamellar variety of albite; white with pearly lustre.

Clinopyroxene. Monoclinic member of the pyroxene group. Includes aegirine, augite, clinoenstatite, diopside.

Clinosafflorite. $(Co,Fe,Ni)As_2$. Monoclinic variety of safflorite. Associated with skutterudite in cobalt deposits.

Clinozoisite. $Ca_2Al_3(SiO_4)_3(OH)$. H = 7. Light green to greenish-grey prismatic crystals; also granular or fibrous masses. Vitreous lustre. Perfect cleavage. Member of the epidote group. Occurs in metamorphic rocks.

Cobalt bloom. Term used by miners for erythrite.

Cobaltite. CoAsS. H = 5.5. Light grey metallic crystals (cubes, pyritohedrons) or massive. Perfect cleavage. Pinkish tinge distinguishes it from other grey metallic minerals. Crystals resemble pyrite but differ in colour. Associated with cobalt and nickel sulphides or arsenides. Ore of cobalt.

Cobalt pentlandite. Co_9S_8. A rare mineral intimately associated with sulphides and arsenides in ore deposits at Cobalt, Ontario.

Coffinite. $U(SiO_4)_{1-x}(OH)_{4x}$. H = 5-6. Black with adamantine lustre; dull brown. Finely granular massive. Associated with uraninite from which it is indistinguishable in the hand specimen.

Colemanite. $Ca_2B_6O_{11}•5H_2O$. H = 4.5. Colourless to white prismatic crystals; cleavable or granular massive. Transparent to translucent with vitreous lustre. Flame test produces green colour. Occurs in borate and gypsum deposits.

Colerainite. $(Mg,Fe)_5Al(Si_3Al)O_{10}(OH)_8$. Thin colourless to white hexagonal plates forming rosettes and botryoidal aggregates. Pearly lustre. Associated with serpentine. Named for Coleraine Township, Quebec, where it was first found. Variety of clinochlore. Not a valid mineral name.

Coloradoite. HgTe. H = 2.5. Dark grey to black metallic granular masses. Soluble in HNO_3. Occurs with gold and silver tellurides.

Columbite. $(Fe,Mn)(Nb,Ta)_2O_6$. H = 6-7. Brownish-black to black prismatic or tabular crystals forming divergent or parallel groups; also massive. Submetallic lustre. Black to reddish-brown streak. Occurs in pegmatites. Ore of niobium used in high-temperature steel alloys.

Colusite. $Cu_{26}V_2(As,Sn,Sb)_6S_{32}$. H = 3-4. Bronze-yellow to bronze-brown granular massive or tetrahedral crystals. Associated with other copper minerals in ore deposits.

Concretion. Rounded mass formed in sedimentary rocks by accretion of some constituent (iron oxides, silica, etc.) around a nucleus (mineral impurity, fossil fragment, etc.).

Conglomerate. A sedimentary rock composed of rounded pebbles or gravel.

Connellite. $Cu_{19}Cl_4(SO_4)(OH)_{32}•3H_2O$. H = 3. Light azure-blue translucent acicular crystals. Vitreous lustre. Distinguished from azurite by lack of effervescence in HCl and by lighter colour.

Cookeite. $LiAl_4(Si_3Al)O_{10}(OH)_8$. H = 2.5-3.5. White, pink, greenish, yellowish, or brown pseudohexagonal plates; also scaly. Transparent to translucent with pearly or silky lustre. Occurs with lithium minerals in granite pegmatites. Chlorite group.

Copiapite. $Fe_5(SO_4)_6(OH)_2 \cdot 20H_2O$. H = 2.5-3. Light yellow to orange-yellow and greenish-yellow granular to scaly aggregates; also tabular crystals. Transparent to translucent. Vitreous to pearly lustre. Secondary mineral formed by oxidation of sulphides, especially pyrite. Yellow colour is characteristic.

Copper. Cu. H = 2.5-3. Massive, filiform, or arborescent; crystals (cubic or dodecahedral) rare. Hackly fracture. Ductile and malleable. Occurs in lavas.

Coquimbite. $Fe_2(SO_4)_3 \cdot 9H_2O$. H = 2.5. White, yellowish, greenish, or violet, massive; also prismatic crystals. Vitreous lustre. Astringent taste. Secondary mineral formed from pyrite ore.

Cordierite. $Mg_2Al_4Si_5O_{18}$. H = 7. Blue to purplish-blue, bluish-grey, or colourless massive or irregular grains. Vitreous lustre. Subconchoidal fracture. Alters readily to muscovite or chlorite. Distinguished by its colour and by its alteration products. Occurs in metamorphic rocks (schists, gneisses). Gem variety is known as iolite.

Cordylite. $(Ce,La)_2Ba(CO_3)_3F_2$. H = 4.5. Short colourless or yellowish hexagonal prisms. Transparent; greasy to adamantine, pearly lustre. Occurs in nepheline syenite rocks.

Corundum. Al_2O_3. H = 9. Blue, red, yellow, violet, or brown hexagonal prisms or barrel-shaped, pyramidal, or flat tabular crystals. Uneven to conchoidal fracture. Adamantine to vitreous lustre. Distinguished by its hardness and characteristic barrel-shaped form. Used as an abrasive. Transparent red (ruby), blue (sapphire), yellow, and violet varieties are used as gemstones. Translucent varieties may produce star ruby and star sapphire gemstones.

Cosalite. $Pb_2Bi_2S_5$. H = 2.5-3. Dark grey metallic prismatic, needle-like, fibrous, or feathery aggregates; massive. Soluble in HNO_3. Associated with smaltite and cobaltite.

Covellite. CuS. H = 1.5-2. Inky blue, metallic; iridescent in shades of brass yellow, purple, coppery red. Massive; platy crystals (hexagonal) rare. Distinguished from chalcocite and bornite by its perfect cleavage and colour.

Crandallite. $CaAl_3(PO_4)_2(OH)_5 \cdot H_2O$. H = 5. Minute yellow to white or grey prisms; also fibrous, nodular, or finely granular massive. Transparent to translucent with vitreous or dull lustre. Occurs with other secondary phosphate minerals.

Criddleite. $TlAg_2Au_3Sb_{10}S_{10}$. Fine grey metallic grains (up to 50 μm) associated with aurostibite; recognized only by microscopic examination of polished sections. Occurs in the Hemlo gold deposit, the type locality. Named in honour of ore mineralogist Alan J. Criddle, British Museum, London.

Cristobalite. SiO_2. H = 6.5. White, grey, bluish octahedral (less than 1 mm) crystals; fibrous, massive, stalactitic, botryoidal. Translucent to opaque; vitreous to dull lustre. Occurs in volcanic rocks.

Crocidolite. Blue or bluish-grey asbestiform variety of riebeckite (amphibole). Known as "blue asbestos". Used as an insulator. Not a valid mineral name.

Crocoite. $PbCrO_4$. H = 2.5-3. Red-orange to yellow prismatic crystals; massive. Transparent to translucent; adamantine to vitreous lustre. Secondary mineral formed by oxidation of minerals containing lead and chromium.

Cryolite. Na_3AlF_6. H = 2.5. Colourless, yellow, reddish, or brownish, massive granular; crystals with cubo-octahedral aspect. Transparent; vitreous to greasy. Appears to disappear when immersed in water. Soluble in H_2SO_4.

Cryptomelane. KMn_8O_{16}. H = 6-6.5. Grey, greyish-black to black compact to loosely granular massive; also radiating fibres, botryoidal. Metallic to dull lustre. Brownish-black streak. Secondary mineral associated with manganese minerals.

Crystalline limestone. A limestone that has been metamorphosed or recrystallized. Also known as marble. Used as building, monument, and ornamental stone. Dolomitic crystalline limestone contains a high proportion of dolomite.

Cubanite. $CuFe_2S_3$. H = 3.5. Brass-yellow to bronze-yellow tabular crystals or massive. Distinguished from chalcopyrite by its strong magnetism. Associated with other copper-iron sulphides. Rare mineral.

Cuprite. Cu_2O. H = 3.5-4. Red to almost black octahedral, dodecahedral, or cubic crystals, massive, earthy. Adamantine, submetallic, or earthy lustre. Brownish-red streak. Distinguished from hematite by its inferior hardness, from cinnabar and proustite by its superior hardness. On charcoal, it is reduced to a metallic globule of copper. Soluble in concentrated HCl. Associated with native copper and other copper minerals. Ore of copper.

Curite. $Pb_2U_5O_{17}$•$4H_2O$. H = 4-5. Orange, yellow brown, greenish yellow to greenish brown, finely granular. Waxy to dull lustre. Strongly radioactive. Associated with uraninite.

Cyanotrichite. $Cu_4Al_2(SO_4)(OH)_{12}$•$2H_2O$. Minute sky-blue to azure-blue acicular crystals commonly radiating; also extremely fine, plush, or wool-like aggregates. Silky lustre. Secondary mineral found sparingly in copper deposits.

Cyrtolite. A radioactive zircon containing uranium and rare elements. Not a valid mineral name.

Dachiardite. $(Ca,Na_2,K_2)_5Al_{10}Si_{38}O_{96}$•$25H_2O$. H = 4-4.5. Colourless to white prismatic crystals, or fibres forming parallel, divergent groups. Transparent; vitreous to silky lustre. Zeolite group.

Dacite. An igneous rock composed mainly of plagioclase with some quartz and pyroxene or hornblende.

Danaite. (Fe,Co)AsS. Variety of arsenopyrite containing up to 9 per cent cobalt. Not a valid mineral name.

Danburite. $CaB_2(SiO_4)_2$. H = 7. Transparent colourless, light yellow prismatic crystals; white nodules. Clear, colourless danburite is used as a gemstone.

Datolite. $CaBSiO_4(OH)$. H = 6.5. Short transparent colourless, light yellow, green, or white prismatic crystals; also botryoidal porcelain-like masses or granular. Vitreous lustre. Easily fusible. Distinguished by its colour, glassy appearance, crystal form and ease of fusibility.

Dawsonite. $NaAl(CO_3)(OH)_2$. H = 3. Transparent striated square prismatic crystals; rosettes or encrustations of bladed or acicular crystals; tufts of colourless needles; also very fine micaceous aggregates. Lustre is vitreous or pearly in crystals, and silky in micaceous variety. Effervesces in HCl. Distinguished by its striated crystal form. Generally difficult to identiy in the hand specimen because crystals are very small. Originally found in Montreal near the McGill University campus. Named for John William Dawson (1820-1899), geologist and principal of McGill University.

Devilline. $CaCu_4(SO_4)_2(OH)_6 \cdot 3H_2O$. H = 2.5. Bright green to bluish-green transparent platy crystals forming rosettes or tiny masses. Associated with azurite, malachite on copper-bearing rocks; not readily distinguishable from other secondary copper minerals in the hand specimen.

Diabase. Dark-coloured igneous rock composed mostly of lath-shaped crystals of plagioclase and pyroxene. Used as a building, ornamental, and monument stone.

Diaspore. AlO(OH). H = 6.5-7. White, grey, yellow, brown, light violet, pink, or colourless foliated, scaly, granular, or massive aggregates. Platy or acicular crystals. Pearly, vitreous, or brilliant lustre. Associated with aluminous minerals in igneous and metamorphic rocks.

Diatomite. Pulverulent material composed of the siliceous remains of tiny organisms (diatoms), which accumulated on the bottoms of lakes and swamps in Recent geological time. It is light in weight and resembles chalk. Used for insulation, filtration, abrasives, absorbents, etc.

Digenite. Cu_9S_5. H = 2.5-3. Bluish black to black with submetallic lustre. Occurs as pseudocubic crystals or as intergrowths with other copper sulphides.

Diopside. $CaMgSi_2O_6$. H = 6. Colourless, white, grey, green, blue. Transparent to opaque with vitreous lustre. Occurs as short prisms or granular masses in calcium-rich metamorphic rocks. Monoclinic variety of pyroxene.

Diorite. A dark-coloured igneous rock composed mainly of plagioclase and amphibole or pyroxene.

Djurleite. $Cu_{1.96}S$. Properties similar to those of chalcocite from which it is indistinguishable in the hand specimen. Occurs in some Cobalt, Ontario, ore deposits.

Dolomite. $CaMg(CO_3)_2$. H = 3.5-4. Colourless, white, pink, yellow, or grey rhombohedral or saddle-shaped crystals; also massive. Vitreous to pearly lustre. Slightly soluble in cold HCl. Common vein-filling mineral in ore deposits and essential constituent of dolomitic limestone and dolomitic marble. Ore of magnesium used in the manufacture of lightweight alloys.

Dolomitic limestone. Limestone containing 10 to 50 per cent dolomite.

Domeykite. Cu_3As. H = 3-3.5. Light grey, metallic; massive, reniform, or botryoidal. Becomes yellowish to brown or iridescent when tarnished. Occurs with other copper minerals. Soluble in HNO_3 but not in HCl.

Donnayite. $NaCaSr_3Y(CO_3)_6 \cdot 3H_2O$. H = 3. Yellow, colourless, white, grey, brown, or reddish-brown platy, tabular, columnar, or granular aggregates. Vitreous lustre. Associated with microcline, analcime, calcite, natrolite, chlorite, aegirine, and arfvedsonite in nepheline syenite at the type locality, Mont Saint-Hilaire, Quebec. It was named in honour of Professors J.D.H. Donnay and Gabrielle Donnay, McGill University.

Doverite. See synchysite-Y.

Doyleite. $Al(OH)_3$. H = 2.5-3. White platy crystals forming rosettes; pulverulent to compact globules, crusts. Dull lustre. Originally described from Mont Saint-Hilaire, Quebec, where it occurs in albitite, and from Francon Quarry, Montreal where it occurs on weloganite, calcite, and quartz. Named in honour of its discoverer, mineral collector E.J. Doyle of Ottawa.

Dresserite. $Ba_2Al_4(CO_3)_4(OH)_8 \cdot 3H_2O$. H = 2.5-3. White to colourless spheres commonly 3-4 mm in diameter; blade-like crystals with oblique terminations forming tufts, spheres. Transparent to translucent, opaque; silky to vitreous lustre. Effervesces in HCl. Distinguished from dawsonite by its oblique termination. Associated with weloganite in quartz-albite lined cavities in igneous sill rock at the Francon Quarry, Montreal, Quebec, the type locality. Named in honour of geologist John A. Dresser (1866-1954) in recognition of his geological work in the Monteregian Hills, Quebec.

Dufrenoysite. $Pb_2As_2S_5$. H = 3. Long grey metallic striated tabular crystals. Reddish-brown streak. Perfect cleavage. Associated with sphalerite and arsenic minerals.

Dumortierite. $Al_7(BO_3)(SiO_4)_3O_3$. H = 7. Blue, violet, or greenish-blue columnar or fibrous masses; also massive. Vitreous or dull lustre. Transparent to translucent. Difficult to distinguish from cordierite except by X-ray methods. Used in the manufacture of porcelain spark plugs and as a gemstone.

Dundasite. $PbAl_2(CO_3)_2(OH)_4 \cdot H_2O$. H = 2. White silky to vitreous radiating crystals, spherical aggregates, matted encrustations. Effervesces in acids. Secondary mineral associated with lead minerals.

Dunite. Fine grained, dull grey-black ultramafic igneous rock composed mainly of olivine.

Dyke. A long narrow body of igneous rock cutting across the structure of other rocks which it intrudes.

Dyscrasite. Ag_3Sb. H = 3.5-4. Light grey metallic, tarnishing to dark grey. Granular massive, foliated; also pyramidal crystals. Sectile. Occurs in veins with silver minerals and sulphide minerals. Decomposed by HNO_3.

Ekanite. $ThCa_2Si_8O_{20}$. H = 5. Dark reddish-brown, yellow, or green tetragonal prisms or massive. Vitreous lustre. Transparent variety is used as a gemstone. Originally found in gem gravel of Sri Lanka.

Electrum. (Au,Ag). H = 2.5-3. Yellow metallic. Natural alloy of gold and silver with 20 per cent gold content.

Ellsworthite. Amber yellow to dark brown, massive; adamantine lustre. Originally found in 1922 at the McDonald mine near Bancroft, Ontario, and named in honour of H.V. Ellsworth, mineralogist, Geological Survey of Canada. Subsequently found to be a uranpyrochlore. Not a valid mineral name.

Elpidite. $Na_2ZrSi_6O_{15} \cdot 3H_2O$. H = 7. White, light green, or grey, fibrous, prismatic crystals or massive. Vitreous or silky lustre. Found in nepheline syenites. Not readily identifiable in the hand specimen.

Enargite. Cu_3AsS_4. H = 3. Greyish-black to iron-black metallic (dull when tarnished) prismatic or tabular crystals; also massive or granular. When twinned, it forms star-shaped cyclic trillings. Perfect cleavage. Associated with pyrite, galena, sphalerite, and copper sulphides. Good cleavage is characteristic. Ore of copper.

Enstatite. $MgSiO_3$. H = 6. White, green, or brown with vitreous lustre. Occurs as coarse cleavable masses in pyroxenites, peridotite. Orthorhombic variety of pyroxene.

Epididymite. $NaBeSi_3O_7(OH)$. H = 5.5. White prismatic crystals, massive. Silky lustre. Occurs sparingly in nepheline syenites. Not readily identifiable in the hand specimen.

Epidote. $Ca_2(Al,Fe)_3(SiO_4)_3(OH)$. H = 6-7. Yellowish-green massive or fibrous aggregates. Vitreous lustre. Often associated with quartz and pink feldspar producing attractive mottled or veined patterns (unakite). Forms during metamorphism of igneous rocks and limestone, and in veins. Takes a good polish and can be used for jewellery and other ornamental objects.

Epistilbite. $CaAl_2Si_6O_{16}\cdot 5H_2O$. H = 4. Colourless to reddish twinned prismatic crystals, spherical aggregates, or granular massive. Vitreous lustre. Occurs with stilbite and other zeolite minerals in cavities in basalt. Zeolite group.

Erythrite. $Co_3(AsO_4)_2\cdot 8H_2O$. H = 1.5-2.5. Rose-red to crimson globular, radial, or reniform aggregates; also earthy or pulverulent; prismatic to acicular crystals (rare). Dull to adamantine lustre. Soluble in HCl. Secondary mineral formed by the oxidation of cobalt arsenides. Referred to as cobalt bloom.

Esker. A long stream-deposited ridge or mound formed by the accumulation of sand, gravel, and boulders left by retreating glaciers.

Eucairite. CuAgSe. H = 2.5. Light grey, metallic; tarnishes to a bronze colour. Granular massive. Associated with other selenides in copper deposits.

Eucryptite. $LiAlSiO_4$. H = 6.5. Short colourless or white hexagonal prisms; more commonly massive granular. Transparent with vitreous lustre. Fluoresces pink in ultraviolet light. Occurs with lithium minerals in granite pegmatite.

Eudialyte. $Na_4(Ca,Ce)_2(Fe,Mn,Y)ZrSi_8O_{22}(OH,Cl)_2$. H = 5-5.5. Pink, red, yellow, brown, massive; as grains, or tabular or rhombohedral crystals. Transparent with vitreous lustre. Occurs in nepheline syenite. Difficult to identify in the hand specimen.

Eulytite. $Bi_4(SiO_4)_3$. H = 4.5. Yellow, grey, light green, brown, or white tetrahedral crystal aggregates, also spherical forms. Associated with bismuth minerals.

Euxenite. $(Y,Ca,Ce,U,Th)(Nb,Ta,Ti)_2O_6$. H = 5.5-6.5. Black massive or prismatic crystals forming parallel or radial groups. Brilliant, submetallic or greasy lustre. Conchoidal fracture. Radioactive. Distinguished from other radioactive minerals by X-ray methods.

Evaporite. Sedimentary rock formed by evaporation of minerals such as gypsum or halite from saline waters.

Ewaldite. $Ba(Ca,Y,Na,K)(CO_3)_2$. Bluish-green aggregates of microcrystals; tiny white tabular crystals. Associated with mckelveyite.

Facet cut. Polished gemstone featuring numerous flat surfaces, as in diamond.

Facies. A distinctive rock type corresponding to a certain environment or mode of origin.

Fairfieldite. $Ca_2(Mn,Fe)(PO_4)_2\cdot 2H_2O$. H = 3.5. White, greenish-white, or yellow transparent prismatic crystals; also foliated, fibrous, lamellar, or radiating aggregates. Brilliant or pearly lustre. Soluble in acids. Occurs in granite pegmatite.

Faujasite. $(Na_2,Ca)Al_2Si_4O_{12}\cdot 8H_2O$. H = 5. Colourless or white octahedral crystals. Vitreous lustre. Distinguished from fluorite by its superior hardness.

Fault. Structural feature produced by the movement of one rock mass relative to another; the terms shear zone, brecciated zone, and fault zone refer to the region affected by the movement.

Feldspar. A mineral group consisting of aluminosilicates of potassium and barium (monoclinic or triclinic), and of sodium and calcium (triclinic). Orthoclase and microcline belong to the first group, plagioclase to the second. Used in the manufacture of glass, ceramics, porcelain enamel, porcelain, pottery, scouring powders, and artificial teeth.

Felsic. A term describing an igneous rock composed mostly of light-coloured minerals such as feldspar, feldspathoids, quartz, and muscovite.

Felsite. A dense, fine grained, light-coloured (pink or grey) igneous rock composed mainly of feldspar with little or no quartz.

Ferberite. $FeWO_4$. H = 4-4.5. Black striated wedge-shaped prisms; also bladed or massive. Metallic lustre. Brownish-black to black streak. Weakly magnetic. Ore of tungsten.

Fergusonite. $(Y,Ce,La,Nd)(Nb,Ti)O_4$. H = 5.5-6.5. Black prismatic or pyramidal crystals; also massive. Brilliant to submetallic lustre on fresh surfaces; grey, yellowish or brownish on exposed surfaces. Subconchoidal fracture. Radioactive. Occurs in granite pegmatites. Distinguished from other radioactive minerals by X-ray methods.

Fersmite. $(Ca,Ce,Na)(Nb,Ta,Ti)_2(O,OH,F)_6$. H = 4-4.5. Dark brown to black striated prisms; also tabular. Subvitreous to resinous lustre. Greyish-brown streak. Occurs with niobium minerals in marble and in pegmatites.

Fibroferrite. $Fe(SO_4)(OH)\cdot 5H_2O$. H = 2.5. White, yellow, or greenish fibrous masses; also radiating fibres. Silky or pearly lustre. Formed by oxidation of pyrite and associated with other secondary iron minerals from which it is distinguished by X-ray methods.

Fischesserite. Ag_3AuSe_2. H = 2. Metallic grains associated with clausthalite, native gold, chalcopyrite, pyrite, and other selenides.

Flint. Yellowish-grey or brown, dark grey to black opaque variety of chalcedony. Used by primitive peoples for tools.

Fluoborite. $Mg_3(BO_3)(F,OH)_3$. H = 3.5. Colourless, white, or pink transparent to translucent hexagonal prisms, prismatic or granular aggregates; vitreous, silky, or pearly lustre. May fluoresce white in ultraviolet light. Resembles apatite but has an inferior hardness. Occurs in crystalline limestone.

Fluorescence. Property of certain substances to glow when exposed to ultraviolet light, X-rays, or cathode rays. It is caused by impurities in the substance or by defects in its crystal structure. Two wavelengths are commonly used to produce ultraviolet fluorescence: long wave (3200 to 4000 Angstrom units), short wave (2537 Angstrom units).

Fluorite. CaF_2. H = 4. Transparent, colourless, blue, green, violet, or yellow cubic or, less commonly, octahedral crystals; also granular massive. Vitreous lustre. Good cleavage. Often fluorescent; this property derives its name from the mineral. Used in optics, steel making, ceramics.

Fluor-richterite. $Na(Ca,Na)Mg_3Si_8O_{22}F_2$. H = 5-6. Dark grey to dark greenish-grey long prismatic crystals or aggregates of crystals. Fluorine-rich variety of richlerite; amphibole group. Not a valid mineral name.

Forsterite. Mg_2SiO_4. H = 6.5. White or light green square prismatic or tabular crystals; also massive. Vitreous lustre. Conchoidal fracture. Member of the olivine group; distinguished from other members of the group by X-ray methods. Used in the manufacture of refractory bricks.

Franconite. $Na_2Nb_4O_{11}9H_2O$. White microscopic globules and globular aggregates (about 0.5 mm across) with vitreous to silky lustre. Dissolves in HCl. Occurs on weloganite, calcite, and quartz crystals at the Francon Quarry, Montreal, the type locality. Named for the locality.

Freibergite. $(Ag,Cu,Fe)_{12}(Sb,As)_4S_{13}$. A silver-rich member of the tetrahedrite-tennantite series.

Freieslebenite. $AgPbSbS_3$. H = 2-2.5. Grey metallic striated prismatic crystals. Grey streak. Associated with silver and lead ores.

Froodite. $PdBi_2$. H = 2. Grey metallic grains associated with arsenic-lead-copper ores. Originally described from the Frood mine, Sudbury district, Ontario, for which it is named.

Fuchsite. An emerald-green chromian muscovite. Not a valid mineral name. Also called chrome mica.

Gabbro. A dark, coarse grained igneous rock composed mainly of calcic plagioclase and pyroxene. Used as a building stone and monument stone.

Gadolinite. $(Ce,La,Nd,Y)_2FeBe_2Si_2O_{10}$. H = 6.5-7. Black prismatic crystals or massive. Vitreous lustre. Occurs in pegmatite.

Gahnite. $ZnAl_2O_4$. H = 7.5-8. Dark blue-green, yellow, or brown octahedra, rounded grains, massive. Vitreous lustre. Occurs in granite pegmatite and in marble. Spinel group.

Gaidonnayite. $Na_2ZrSi_3O_9{\bullet}2H_2O$. Colourless, white to light yellowish-brown striated bladed crystals. Transparent; vitreous. Occurs in nepheline syenite at Mont Saint-Hilaire, Quebec, as crystals on analcime, in cavities in natrolite; also occurs in pegmatite dykes with catapleiite, elpidite, hilairite, albite, microcline, chlorite, aegirine, epididymite, and goethite. Named in honour of Gabrielle Donnay, professor of crystallography, McGill University.

Galena. PbS. H = 2.5. Dark grey metallic cubic crystals or crystal aggregates; also massive. Perfect cleavage. Distinguished by its high (7.58) specific gravity and perfect cleavage. Ore of lead; may contain silver.

Galkhaite. $(Cs,Tl)(Hg,Cu,Zn)_6(As,Sb)_4S_{12}$. H = 3. Orange-red cubic crystals; granular aggregates. Vitreous to adamantine lustre. Occurs in arsenic-antimony-mercury deposits.

Garnet. Silicate of Al, Mg, Fe, Mn, Ca. H = 6.5-7.5. Transparent red dodecahedral crystals or massive; also colourless, yellow, brown, orange, green, black. Used as an abrasive; clear garnet is used as a gemstone. Distinguished by its crystal form. Mineral group consisting of several species including almandine, grossular, pyrope, spessartine.

Genthelvite. $Zn_4Be_3(SiO_4)_3S$. H = 6-6.5. Light yellow to brown, yellowish-green, or reddish-brown tetrahedral crystals, and massive. Vitreous lustre. Uneven to conchoidal fracture. Helvite group.

Genthite. Hydrous nickel silicate, also known by the general term garnierite. Not a valid mineral species.

Gersdorffite. NiAsS. H = 5.5. Light to dark grey, metallic; octahedral, pyritohedral crystals or granular massive. Associated with other nickel minerals in vein deposits.

Getchellite. $AsSbS_3$. H = 1.5-2. Dark red resinous microscopic crystals; also granular or micaceous. May show violet or green iridescence. Associated with stibnite, realgar, orpiment.

Gibbsite. $Al(OH)_3$. H = 2.5-3.5. White six-sided tabular crystals; massive. Translucent, vitreous to pearly, or dull; earthy. Secondary mineral formed by alteration of aluminum minerals.

Gittinsite. $CaZrSi_2O_7$. H = 3.5-4. White fibrous radiating masses. Occurs as intergrowths with apophyllite in pegmatite. Originally described from the Kipawa area, Quebec, and named in honour of Professor John Gittens, University of Toronto.

Gladite. $PbCuBi_5S_9$. Dark grey metallic prismatic crystals. Associated with other lead-bismuth sulphide minerals.

Glaucodot. $(Co,Fe)AsS$. H = 5. Light grey to reddish-grey metallic striated prismatic crystals, or massive. May form cruciform twins. Decomposed by HNO_3, forming a pink solution. Associated with cobaltite from which it is distinguished by crystal form and colour.

Glauconite. $(K,Na)(Fe,Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$. H = 2. Greyish, bluish, or yellowish-green fine platy aggregates. Commonly occurs in sedimentary rocks. Mica group.

Gmelinite. $(Na_2,Ca)Al_2Si_4O_{12}{\bullet}6H_2O$. H = 4.5. Colourless, white, light yellow, green, or pink striated tabular, pyramidal, or rhombohedral crystals. Transparent, vitreous. Occurs in basalt and other igneous rocks. Zeolite group.

Gneiss. A coarse grained foliated metamorphic rock composed mainly of feldspar, quartz, and mica. Used as a building stone and as monument stone.

Godlevskite. $(Ni,Fe)_7S_6$. Light yellow, metallic. Occurs as microscopic grains and aggregates associated with nickel and copper ores.

Goethite. $FeO(OH)$. H = 5-5.5. Dark brown, reddish, or yellowish-brown earthy, botryoidal, fibrous, bladed, or loosely granular masses; also prismatic, acicular, or tabular crystals, or scaly. Characteristic yellowish-brown streak. Weathering product of iron-rich minerals. Ore of iron.

Gold. Au. H = 2.5-3. Yellow metallic irregular masses, plates, scales, nuggets. Rarely as crystals. Distinguished from other yellow metallic minerals by its hardness, malleability, high specific gravity (19.3). Precious metal.

Gossan. Rusty oxidation product consisting of hydrated iron oxides derived from the weathering of pyrite and pyrrhotite. Commonly occurs as an outcrop of the upper zone of pyrite-bearing veins.

Götzenite. $Na_2Ca_5Ti(Si_2O_7)_2F_4$. Light yellowish-brown to colourless radiating acicular aggregates. Vitreous lustre. Rare mineral, difficult to identify in the hand specimen. Occurs with pectolite, natrolite, apophyllite at Mont Saint-Hilaire, Quebec.

Granite. Relatively coarse grained grey to reddish igneous rock composed mainly of feldspar and quartz. Used as a building stone and as monument stone.

Granite gneiss. Gneiss having the mineral composition of granite.

Granite pegmatite. Pegmatite having the mineral composition of granite.

Granodiorite. A coarse grained igneous rock with composition intermediate between granite and diorite.

Graphic granite. A granitic rock composed of a regular intergrowth of quartz and K-feldspar producing a geometric pattern resembling hieroglyphic writing. An attractive ornamental stone.

Graphite. C. H = 1-2. Dark grey to black metallic flaky or foliated masses. Flakes are flexible. Greasy to touch. Black streak and colour distinguish it from molybdenite. Usually occurs in metamorphic rocks. Used as a lubricant in the manufacture of 'lead' pencils and refractories.

Greenockite. CdS. H = 3-3.5. Yellow earthy coating; rarely as pyramidal crystals. Resinous to adamantine lustre. Associated with sphalerite. Dissolves in HCl giving strong H_2S odour.

Greenstone. A metamorphosed volcanic rock composed mainly of chlorite.

Greywacke. Sedimentary rock containing large amounts of amphibole or pyroxene and feldspar.

Grossular. $Ca_3Al_2(SiO_4)_3$. H = 6.5-7. Colourless, white, yellow, pink, orange, brown, red, black, or green transparent to opaque dodecahedral or trapezohedral crystals; massive granular. Vitreous lustre. Occurs in metamorphosed limestone and skarn zones with other calcium silicates. Transparent varieties are used as a gemstone. Garnet group.

Groutite. MnO(OH). H = 5.5. Black lustrous acicular, prismatic, wedge-shaped crystals. Associated with other manganese minerals.

Gudmundite. FeSbS. H = 6. Light grey to dark grey metallic, elongated striated prismatic crystals; also massive, lamellar. Light bronze when tarnished. Not readily distinguishable from other grey metallic sulphides in the hand specimen.

Gunningite. $ZnSO_4 \cdot H_2O$. H = 2.5. White powder occurring as an efflorescence on sphalerite from which it has oxidized. First described from the Keno Hill, Yukon, deposits, and named for Dr. H.C. Gunning, a former geologist with the Geological Survey of Canada and later head of the Geology Department, University of British Columbia.

Gustavite. $PbAgBi_3S_6$. Dark grey metallic tabular grains. Rare mineral associated with bismuth-lead-silver sulphosalt minerals.

Gypsum. $CaSO_4 \cdot 2H_2O$. H = 2. White, grey, light brown, granular massive; also fibrous (satin spar), or colourless transparent (selenite). Distinguished from anhydrite by its inferior hardness. Occurs in sedimentary rocks. Used in the construction industry (plaster, wallboard, cement, tiles, paint) and as a soil conditioner and fertilizer. Satin spar, selenite, and alabaster (fine grained translucent variety) are used for carving into ornamental objects.

Gyrolite. $NaCa_{16}(Si_{23}Al)O_{60}(OH)_5 \cdot 15H_2O$. H = 3-4. Colourless to white concretions with a radiating internal structure. Vitreous lustre. Associated with zeolite minerals in cavities in basalt. Zeolite group.

Hackmanite. $Na_8Al_6Si_6O_{24}Cl_2S$. H = 6. Light violet to bluish violet, massive. Fades on exposure to sunlight. Vitreous to greasy lustre. Fluoresces yellow when exposed to ultraviolet rays. Variety of sodalite.

Halite. NaCl. H = 2.5. Colourless, white, grey, yellow, or blue transparent to translucent vitreous crystals (cubes) or granular masses. May be fluorescent. Water soluble. Occurs in sedimentary rocks, in springs, seas, and salt lakes, and in dried inland lake basins. Used for the production of sodium, chlorine, hydrochloric acid, and in natural state as table salt.

Halotrichite. $FeAl_2(SO_4)_4 \cdot 22H_2O$. H = 1.5. White hair-like crystals; spherical aggregates. Vitreous lustre. Astringent taste. Secondary mineral formed by weathering of pyrite.

Harmotome. $(Ba,K)_{1-2}(Si,Al)_8O_{16} \cdot 6H_2O$. H = 4.5. Colourless, white, grey, yellow, pink, or brown cruciform penetration twins or radiating aggregates. Transparent to translucent, vitreous. Occurs in basalt and other igneous rocks. Zeolite group.

Hatchettolite. H = 4. Amber to black irregular masses. Occurs with radioactive zircon (cyrtolite) in pegmatite. Not a valid mineral name. Accepted name is uranpyrochlore.

Hauchecornite. $Ni_9Bi(Sb,Bi)S_8$. H = 5. Light yellow, metallic, tarnishing to dark bronze; tabular, bipyramidal, prismatic crystals. Conchoidal fracture. Black streak. Occurs in nickel-bismuth ores.

Hausmannite. Mn_3O_4. H = 5.5. Brownish black, greasy to submetallic, fine grained massive. Associated with other manganese minerals and difficult to distinguish from them in the hand specimen. Ore of manganese.

Hawleyite. CdS. Bright yellow powdery coating; earthy. Associated with sphalerite and siderite. First described from the lead-silver-zinc deposit at the Hector-Calumet Mine, Elsa, Yukon. Named for Professor J.E. Hawley, Queen's University, Kingston.

Heazlewoodite. Ni_3S_2. H = 4. Yellow, metallic; massive, granular, or platy aggregates. Distinguished from pyrite by its inferior hardness.

Hedenbergite. $CaFeSi_2O_6$. H = 6. Green to black short prismatic crystals or massive. Translucent to opaque; vitreous to dull. Monoclinic variety of pyroxene.

Hellandite. $(Ca,Y)_6(Al,Fe)Si_4B_4O_{20}(OH)_4$. H = 5.5. Red to brown tabular, prismatic crystals. Occurs with tourmaline and rare-earth minerals in granite pegmatite.

Hematite. Fe_2O_3. H = 5.5-6.5. Reddish brown to black, massive, botryoidal, or earthy; also foliated or micaceous with high metallic lustre (specularite). Characteristic red streak. Greasy to dull lustre. Ore of iron.

Hemimorphite (Calamine). $Zn_4Si_2O_7(OH)_2 \cdot H_2O$. H = 5. White, brownish, light blue, or green thin tabular crystals; also massive, stalactitic, or mammillary. Vitreous lustre. Associated with smithsonite in zinc deposits; distinguished from it by lack of effervescence in HCl and superior hardness. Minor ore of zinc.

Hemloite. $(As,Sb)_4(Ti,Fe,V,Al)_{24}(O,OH)_{48}$. Black metallic to submetallic with black streak. Occurs as grains associated with rutile, molybdenite, titanite, pyrite, sphalerite, arsenopyrite, vanadian muscovite, microcline, and quartz in the Hemlo gold deposit, the type locality. Named for the locality.

Hessite. Ag_2Te. H = 2-3. Grey, metallic, finely granular, massive. Sectile. Occurs with native gold and with other tellurides in vein deposits.

Heterogenite. CoO(OH). H = 3-4. Black to dark brown, reddish globular or reniform masses with conchoidal fracture. Alteration product of smaltite.

Heulandite. $(Na,Ca)_{2-3}Al_3(Al,Si)_2Si_{13}O_{36}\bullet12H_2O$. H = 3-4. Colourless, white, pink, or orange tabular crystals. Vitreous or pearly lustre. Distinguished from other zeolites by its crystal form.

Hexahydrite. $MgSO_4\bullet6H_2O$. Colourless, white, finely fibrous, columnar; also globular encrustations. Pearly to vitreous lustre. Bitter, saline taste. Occurs sparingly as an alteration product of epsomite. Originally found at a Bonaparte River locality in British Columbia. Associated with other sulphates from which it is not readily distinguished.

Hibschite. $Ca_3Al_2(SiO_4)_{3-x}(OH)_{4x}$. H = 6. Colourless, light yellow, or greenish-white octahedral crystals (minute) or massive. Vitreous to greasy lustre. Uncommon mineral, not readily identifiable in hand specimen. Garnet group.

Hilairite. $Na_2ZrSi_3O_9\bullet3H_2O$. H = +4. Very small trigonal light brown transparent crystals, and pink porcelain-like opaque crystals. Associated with analcime, natrolite, microcline, catapleiite, elpidite, aegirine, and chlorite in nepheline syenite at Mont Saint-Hilaire, Quebec, the type locality for which the mineral was named.

Hilgardite. $Ca_2B_5O_9Cl\bullet H_2O$. H = 5. Colourless transparent tabular crystals. Vitreous lustre. Occurs in salt deposits and in gypsum or anhydrite deposits.

Hiortdahlite. $(Ca,Na)_3(Zr,Ti)Si_2O_7(O,F)_2$. H = 5.5. Yellow to brown tabular crystals. Translucent to transparent; vitreous. Occurs in alkalic igneous rocks.

Hisingerite. $Fe_2Si_2O_5(OH)_4\bullet2H_2O$. H = 3. Black to brownish black, compact, massive with conchoidal fracture. Greasy to dull lustre. Alteration product of iron-bearing minerals.

Hochelagaite. $(Ca,Na,Sr)Nb_4O_{11}\bullet8H_2O$. H ~ 4. White microscopic globules composed of radiating blades. Vitreous lustre. Occurs on crystals of weloganite, calcite, and quartz at the Francon Quarry, Montreal, the type locality. Indistinguishable from franconite in the hand specimen. Named for Hochelaga, the original name for Montreal.

Hollingworthite. (Rh,Pt,Pd)AsS. H = 6. Grey metallic grains intergrown with platinum minerals such as sperrylite.

Holmquistite. $Li_2(Mg,Fe)_3Al_2Si_8O_{22}(OH)_2$. H = 5-6. Violet to light blue prismatic, acicular to fibrous aggregates; also massive. Transparent to translucent with vitreous lustre. Associated with lithium-rich pegmatites occurring in wall rock. Orthorhombic member of amphibole.

Hornblende. $Ca_2(Fe,Mg)_4Al(Si_7Al)O_{22}(OH,F)_2$. H = 6. Dark green, brown, or black prismatic crystals, or massive. Vitreous lustre. Common rock-forming mineral. Monoclinic variety of amphibole.

Howlite. $Ca_2B_5SiO_9(OH)_5$. H = 3.5. Colourless to white vitreous granular masses; transparent elongated tabular crystals; compact nodular masses. Crystals distinguished from selenite by superior hardness. Occurs in sedimentary rocks. Named after Henry How, Nova Scotia mineralogist who first described it in 1868.

Humite. $(Mg,Fe)_7(SiO_4)_3(F,OH)_2$. H = 6-6.5. Yellow to orange granular or massive. Vitreous to resinous lustre. Difficult to distinguish from other members of the humite group (chondrodite, norbergite, clinohumite). Occurs in crystalline limestone.

Hydroboracite. $CaMgB_6O_8(OH)_6\bullet3H_2O$. H = 2-3. Colourless transparent vitreous prismatic crystals; white fibrous masses with silky lustre. Occurs in salt and borate deposits. Soluble in acids.

Hydrocarbon. Naturally occurring compounds of carbon and hydrogen such as paraffin, and compounds of carbon, hydrogen, and oxygen such as amber, petroleum, coal. Compounds are of organic origin and are not classified as minerals.

Hydrocerussite. $Pb_3(CO_3)_2(OH)_2$. H = 3.5. Tiny colourless to white or grey hexagonal scales and plates. Transparent to translucent with adamantine or pearly lustre. Associated with cerussite from which it is not readily distinguished. Alteration product of lead, galena.

Hydrodresserite. $BaAl_2(CO_3)_2(OH)_4 \bullet 3H_2O$. H = 3-4. White spheres and hemispheres (2 to 4 mm across) composed of radiating blades. Translucent to opaque. Dehydrates to dresserite from which it cannot be distinguished in hand specimen. Effervesces in HCl. Occurs with quartz, dawsonite, and weloganite at the Francon Quarry, Montreal, the type locality. Named for its composition and genesis.

Hydromagnesite. $Mg_5(CO_3)_4(OH)_2 \bullet 4H_2O$. H = 3.5. Colourless or white, transparent, flaky, acicular, or bladed crystals, aggregates forming tufs, rosettes, or encrustations; also massive. Vitreous, silky, or pearly lustre. Associated with serpentine, brucite, magnesite. Effervesces in acids. Distinguished from calcite by its habit.

Hydronepheline. Pink to orange-red nodular or irregular patches in nepheline syenite. Not a valid species. In Bancroft area, what was referred to as hydronepheline is natrolite.

Hydrotalcite. $Mg_6Al_2(CO_3)(OH)_{16} \bullet 4H_2O$. H = 2. White, transparent, foliated lamellar aggregates; also platy. Pearly to waxy lustre. Greasy feel. Distinguished from talc by its effervescence in dilute HCl and by its superior hardness. Associated with talc, serpentine deposits.

Hydroxylbastnaesite. $(Ce,La)(CO_3)(OH,F)$. H = 4. Yellow to brown, pinkish-brown or dark green opaque irregular to reniform masses. Waxy, greasy, or resinous lustre. Associated with other rare-earth minerals.

Hydrozincite. $Zn_5(CO_3)_2(OH)_6$. H = 2-2.5. White to grey, yellowish, brownish, or pinkish fine grained, compact to earthy or gel-like masses; also stalactitic, reniform, pisolitic, concentrically banded, or radially fibrous aggregates; flat blade-like crystals. Dull, silky, or pearly lustre. Fluoresces light blue or light violet in ultraviolet light. Secondary mineral found in oxidized zones in zinc deposits.

Hypersthene. $(Mg,Fe)_2Si_2O_6$. H = 6. Brown to blackish-brown prismatic crystals or granular to cleavable masses. May have a bronze lustre (bronzite). Occurs in anorthosites, peridotites, and pyroxenites. Intermediate member of the orthorhombic enstatite-ferrosilite series, pyroxene group. Bronze variety used as a gemstone.

Igneous. Rocks that have crystallized from magma or from the melting of other rocks; usually composed of feldspar, quartz, and hornblende, pyroxene, or biotite.

Ilesite. $(Mn,Zn,Fe)SO_4 \bullet 4H_2O$. Green to white loose prismatic crystal aggregates. A secondary mineral formed by oxidation in sulphide veins.

Illite. $(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}(OH)_2, \bullet H_2O$. H = 1-2. White finely micaceous to clay-like. Dull lustre. Perfect cleavage. Mica-clay mineral.

Ilmenite. $FeTiO_3$. H = 5-6. Black metallic to submetallic. Compact or granular massive; thick tabular crystals. Black streak distinguishes it from hematite. Ore of titanium.

Ilmenomagnetite. Titanium-bearing magnetite containing ilmenite in exsolution. Not a valid mineral name.

Ilmenorutile. $(Ti,Nb,Fe)_3O_6$. H = 6. Black to greenish-black plates, rosettes. Opaque; velvety to submetallic lustre. Occurs in dawsonite, calcite at the Francon Quarry, Montreal.

Insizwaite. $Pt(Bi,Sb)_2$. Metallic grains and massive. Associated with pentlandite, chalcopyrite, and nickel and platinum minerals.

Inyoite. $Ca_2B_6O_6(OH)_{10}{\bullet}8H_2O$. H = 2. Colourless, transparent prismatic to tabular crystals; granular massive. Vitreous lustre. Occurs in gypsum and borate deposits. Soluble in dilute acids and in hot water.

Irarsite. (Ir,Ru,Rh,Pt)AsS. Black, metallic, massive. Associated with platinum minerals.

Iridosmine. (Os,Ir). H = 6-7. Light grey metallic tabular or, rarely, short prismatic crystals; flakes, flattened grains. Perfect cleavage. Associated with gold and platinum in placer deposits.

Iron. Fe. H = 4. Dark grey to greyish black metallic blebs or massive. Malleable and magnetic. Soluble in dilute HCl and in acetic acid. Occurs in meteorites. Terrestrial native iron (uncommon) occurs in volcanic rocks.

Iron formation. Metamorphosed sediment containing iron minerals and silica.

Ixiolite. $(Ta,Nb,Sn,Fe,Mn)_4O_8$. H = 6-6.5. Grey metallic prismatic crystals. Occurs in granite pegmatite.

Jade. Term used for two gemstones: nephrite and jadeite.

Jamesonite. $Pb_4FeSb_6S_{14}$. H = 2.5. Dark grey metallic acicular, fibrous, columnar, or plumose aggregates commonly striated. Iridescent tarnish. Decomposes in HNO_3. Occurs in veins with other lead sulphosalts and sulphides.

Jarosite. $KFe_3(SO_4)_2(OH)_6$. H = 2.5-3.5. Yellow to brownish pulverulent coating associated with iron-bearing rocks and with coal. Distinguished from iron oxides by giving off SO_2 when heated.

Jasper. An opaque dark red to brown, yellow, green, or light violet variety of chalcedony. Used as an ornamental stone and as a gemstone.

Jaspilite. A rock consisting of alternating bands of red jasper and iron oxides. An attractive ornamental rock.

Joaquinite. $Ba_2NaCe_2Fe(Ti,Nb)_2Si_8O_{26}(OH,F)_2$. H = 5.5. Yellow to brown tabular or stubby pyramidal crystals. Transparent to translucent; vitreous. Occurs with aegirine and microcline in cavities in breccia at Mont Saint-Hilaire, Quebec. Rare mineral.

Junoite. $Pb_3Cu_2Bi_8(S,Se)_{16}$. Metallic grains (up to 0.5 mm across) associated with chalcopyrite, sphalerite, colbaltite, kesterite, and mawsonite in the Kidd Creek mine, Timmins, Ontario.

Kaersutite. $NaCa_2(Mg,Fe)_4Ti(Si_6Al_2)O_{22}(OH)_2$. H = 5-6. Dark brown to black short prismatic crystals, massive. Translucent to opaque; vitreous to resinous. Occurs in volcanic rocks. Amphibole group.

Kainosite (cenosite). $Ca_2(Y,Ce)_2Si_4O_{12}(CO_3){\bullet}H_2O$. H = 5-6. Yellow to brown, colourless, or pink prismatic crystals. Transparent, vitreous. Occurs in igneous rocks.

Kaolinite. $Al_2Si_2O_5(OH)_4$. H = 2. White, greyish, yellowish, or brownish earthy masses. Dull lustre. Clay mineral formed chiefly by decomposition of feldspars. Becomes plastic when wet. Used as a filler (in paper) and in the manufacture of ceramics.

Karpinskyite. Mixture of leifite [$Na_2(Si,Al,Be)_7(O,OH,F)_{14}$] and zinc-bearing montmorillonite. Not a valid mineral name.

Kasolite. $Pb(UO_2)SiO_4 \cdot H_2O$. H = 4-5. Yellow, greenish yellow, or brown, finely granular; also minute prismatic crystals. Dull to resinous lustre. Radioactive. Soluble in acids. Associated with uraninite and secondary radioactive minerals from which it is not easily distinguished in the hand specimen.

Kermesite. Sb_2S_2O. H = 1-1.5. Red hair-like or tufted radiating aggregates of lath-shaped crystals. Translucent with adamantine to submetallic lustre. Sectile. Alteration product of stibnite. Colour and habit are characteristic. Minor ore of antimony.

Kesterite. $Cu_2(Zn,Fe)SnS_4$. H = 4.5. Greenish black, opaque, massive. Associated with sulphide minerals. Related structurally to stannite.

K-feldspar. $KAlSi_3O_8$. H = 6. Potassium feldspar includes sanidine (colourless), orthoclase (white, pink), and microcline (white, pink, green).

Kiddcreekite. Cu_6SnWS_8. Microscopic metallic irregular grains. Originally found intimately associated with scheelite, clausthalite, tennantite, and tungstenite in a bornite zone in the Kidd Creek mine, Timmins, Ontario. Named for the locality. Identified by microscopic examination of polished surfaces.

Kieserite. $MgSO_4 \cdot H_2O$. H = 3.5. White, granular, massive. Occurs in salt deposits. Dissolves slowly in water.

Kimberlite. Porphyritic igneous rock composed mainly of serpentinized olivine and chloritized phlogopite forming phenocrysts and the fine grained matrix enclosing them. Common host rock for diamond.

Klockmannite. CuSe. H = 2-3. Grey, metallic, tarnishing to bluish black. Granular aggregates; tabular. Associated with other selenides in ore deposits.

Kornerupine. $Mg_4(Al,Fe)_6(Si,B)_4O_{21}(OH)$. H = 6.5. Yellow, brown, red, blue, and green elongated prisms; also fibrous and columnar. Vitreous lustre. Transparent. Occurs in metamorphic rocks. Transparent variety used as a gemstone.

Kotulskite. Pd(Te,Bi). Metallic minute grains intergrown with chalcopyrite and platinum group minerals. Identified by microscopic examination of polished surfaces.

Krennerite. $AuTe_2$. H = 2-3. Light grey to yellow metallic prismatic striated crystals. Occurs with other gold tellurides and with native gold in vein deposits.

Kyanite. Al_2SiO_5. H = 4-5, 6-7. Blue, green, greyish-blue long bladed crystals and bladed masses. Vitreous to pearly lustre. Hardness is 4-5 along the length of the crystal and 6-7 across it. Occurs in schist and gneiss. Colour and variable hardness are distinguishing characteristics. Used in the manufacture of mullite refractories.

Labradorite. $(Ca,Na)(Al,Si)AlSi_2O_8$. H = 6. Grey, vitreous, transparent to translucent. Commonly exhibits blue, green, yellow, or bronze iridescence and is used as a gemstone. Chief constituent of anorthosite and gabbro. Named for Labrador. Variety of plagioclase feldspar.

Labuntsovite. $(K,Ba,Na)(Ti,Nb)(Si,Al)_2(O,OH)_7 \cdot H_2O$. H = 6. Pink, orange, red, or brownish-yellow prismatic, acicular crystals. Perfect cleavage. Occurs in nepheline syenite at Mont Saint-Hilaire, Quebec.

Laitakarite. $Bi_4(Se,S)_3$. H = soft. Grey metallic foliated plates and sheets to 2 mm across. Associated with junoite in the bornite zone at the Kidd Creek mine, Timmins, Ontario.

Lamprophyre. A dark porphyritic igneous rock with hornblende, pyroxene, and biotite forming the phenocrysts in a fine grained matrix composed of the same mafic minerals.

Langisite. (Co,Ni)As. Pinkish, light brown, metallic. Occurs as grains, lamellae in safflorite. Named for the Langis mine, Cobalt, Ontario, where it was orignally found.

Langite. $Cu_4(SO_4)(OH)_6 \cdot 2H_2O$. H = 2.5-3. Transparent tiny blue crystals forming aggregates on copper-bearing rocks. Vitreous to silky lustre. Formed by oxidation of copper sulphides. Difficult to distinguish from other copper sulphates in the hand specimen.

Lapieite. $CuNiSbS_3$. H = 4-5. Grey metallic microscopic grains associated with pyrite, polydymite, gersdorffite, and millerite in a matrix consisting of quartz with altered spinel, magnesite, and bright green mica. Named for the Lapie River, which was named for an Indian guide to explorer Robert Campbell.

Larosite. $(Cu,Ag)_{21}(Pb,Bi)_2S_{13}$. Whitish, light brown acicular crystals associated with chalcocite, stromeyerite in silver-copper ores. Originally found in the Foster mine, Cobalt, Ontario. Named for Mr. Fred LaRose, one of the discoverers of silver-cobalt ore in Cobalt.

Latite. A porphyritic igneous rock consisting of approximately equal amounts of plagioclase and K-feldspar phenocrysts, with little or no quartz, in a fine grained to glassy matrix.

Laumontite. $CaAl_2Si_4O_{12} \cdot 4H_2O$. H = 4. White to pink or reddish white vitreous to pearly prismatic crystal aggregates; also friable, chalky due to dehydration. Characteristic alteration distinguishes it from other zeolites.

Lava. Rock resulting from a volcanic eruption; also referred to as volcanic rock.

Lavenite. $(Na,Ca)_2(Mn,Fe)(Zr,Ti)Si_2O_7(O,OH,F)_2$. H = 6. Yellow to dark brown or brownish red, prismatic, fibrous, acicular aggregates, or massive. Translucent; vitreous to greasy or dull lustre. Occurs in alkalic igneous rocks.

Lazulite. $MgAl_2(PO_4)_2(OH)_2$. H = 5.5.-6. Blue pyramidal or tabular crystals; massive. Vitreous lustre. Soluble in hot acids. Transparent variety used as a gemstone.

Lead. Pb. H = 1.5. Grey metallic platy, dendritic, rounded masses; less commonly octahedral, dodecahedral, or cubic crystals. Malleable and ductile. Rare mineral occurring in various rock environments and in placer deposits. Decomposes readily in HNO_3.

Leadhillite. $Pb_4(SO_4)(CO_3)_2(OH)_2$. H = 2.5-3. Colourless, white, light blue to green tabular or prismatic crystals, or granular massive. Secondary lead mineral associated with galena and other lead minerals. Soluble in HNO_3. Exfoliates in hot water.

Lemoynite. $(Na,Ca)_3Zr_2Si_8O_{22} \cdot 8H_2O$. H = 4. White or yellowish-white minute prismatic crystals, spheres. Occurs in nepheline syenite associated with microcline at Mont Saint-Hilaire, Quebec, the type locality. Named for Charles Lemoyne and his sons, 17th century explorers of New France.

Leonhardtite. Not a valid mineral name. Renamed starkeyite.

Lepidocrocite. $FeO(OH)$. H = 5. Reddish-brown submetallic scaly or fibrous masses. Characteristic orange streak. Associated with goethite as an oxidation product of iron minerals.

Lessingite. $(Ce,Ca)_5(SiO_4)_3F$. H = 4.5. Colourless, greenish or reddish-yellow. Vitreous lustre. Occurs with allanite, bastnaesite, cerite.

Leucophanite. $(Ca,Na)_2BeSi_2(O,F,OH)_7$. H = 4. Green to greenish-yellow tabular crystals with vitreous lustre. Occurs sparingly in nepheline syenite. Not readily distinguished in the hand specimen.

Leucosphenite. $BaNa_4Ti_2B_2Si_{10}O_{30}$. H = 6.5. Light blue, white prismatic crystals; also tabular. Vitreous lustre. Occurs sparingly in nepheline syenite. Not readily distinguished in the hand specimen.

Leucoxene. A general term for alteration products of ilmenite. Not a valid mineral species.

Levyne. $(Ca,Na_2,K_2)Al_2Si_4O_{12}{\cdot}6H_2O$. H = 4-4.5. Colourless, transparent tabular crystals or sheaf-like aggregates; also reddish or yellowish. Vitreous lustre. Occurs in cavities in basalt. Zeolite group.

Liebigite. $Ca_2(UO_2)(CO_3)_3{\cdot}11H_2O$. H = 2.5-3. Light green, or yellowish-green short prismatic crystals; also scaly, granular, botryoidal aggregates. Transparent to translucent with vitreous to pearly lustre. Fluoresces green in ultraviolet light. Secondary mineral formed in uranium deposits.

Limestone. Soft, white, grey, or greyish-brown sedimentary rock formed by deposition of calcium carbonate. Dolomitic limestone contains variable proportions of dolomite and is distinguished from normal limestone by its weaker (or lack of) effervescence in HCl. Used as a building stone and as road metal. Shell limestone (coquina) is a porous rock composed mainly of shell fragments. Crystalline limestone (marble) is a metamorphosed limestone and is used as a building and ornamental stone, as a filler for paper and paints, for the production of magnesium metal, and as crushed stone.

Limonite. Field term referring to natural hydrous iron oxides. Yellow-brown to dark brown earthy, porous, ochreous masses; also stalactitic or botryoidal. Secondary product of iron minerals. Not a valid mineral species.

Linnaeite. Co_3S_4. H = 4.5-5.5. Light grey to dark grey metallic tarnishing to copper red. Octahedral crystals, massive. Decomposed by HNO_3. Uncommon mineral associated with cobalt ores.

Lithiophilite. $LiMnPO_4$. H = 4-5. Yellow, yellowish brown, brown, pink, cleavable to compact massive; crystals (prismatic) are rare. Transparent to translucent with vitreous to subresinous lustre. Becomes brown, dark grey to black on weathered surfaces. Soluble in acids. Occurs with other lithium and phosphate minerals in granite pegmatites. Forms a series with triphylite.

Lithiophosphate. Li_3PO_4. H = 4. Colourless, white, or pink prismatic crystals, or massive. Vitreous lustre. Perfect cleavage. Occurs with other lithium minerals in granite pegmatites.

Loellingite. $FeAs_2$. H = 5-5.5. Light grey to dark grey metallic prismatic crystals; also pyramidal crystals or massive. Occurs with nickel and cobalt minerals in the Cobalt, Ontario, deposits.

Lokkaite. $CaY_4(CO_3)_7{\cdot}9H_2O$. White radiating fibrous aggregates; massive. Alteration product of yttrium minerals.

Ludwigite. Mg_2FeBO_5. H = 5. Greenish-black, opaque, longitudinally striated prisms; dull to submetallic lustre. Also fibrous, acicular, or granular masses. Occurs with brucite, serpentine in contact metamorphic zones.

Lyndochite. Th-Ca-Euxenite. H = 6.5. Black lustrous flat prismatic crystals. Conchoidal fracture. Vitreous lustre. Occurs in pegmatites. Named for Lyndoch Township, Ontario. Not a valid mineral species.

Mackinawite. $(Fe,Ni)_9S_8$. H = 2.5. Yellow, metallic; light grey metallic on freshly broken surfaces. Tetragonal, platy, or pyramidal crystals; also massive, finely lamellar aggregates. Associated with sulphide ore minerals.

Mafic. A term describing an igneous rock composed mostly of dark (ferromagnesian) minerals such as amphibole, pyroxene, biotite.

Magnesite. $MgCO_3$. H = 4. Colourless, white, greyish, yellowish to brown lamellar, fibrous, granular, or earthy masses; crystals rare. Vitreous, transparent to translucent. Distinguished from calcite by lack of effervescence in cold HCl and by superior hardness. Used in the manufacture of refractory bricks, cements, flooring, and magnesium metal.

Magnetite. Fe_3O_4. H = 5.5-6.5. Black metallic octahedral, dodecahedral, or cubic crystals; massive granular. Occurs in vein deposits, in igneous and metamorphic rocks, and in pegmatites. Strongly magnetic. Ore of iron.

Malachite. $Cu_2CO_3(OH)_2$. H = 3.5-4. Green granular, botryoidal, earthy masses; usually forms coatings with other secondary copper minerals on copper-bearing rocks. Distinguished from other green copper minerals by effervescence in HCl. Ore of copper.

Manganite. MnO(OH). H = 4. Steel-grey to iron-black metallic prismatic striated crystal aggregates; also columnar, fibrous, stalactitic, finely granular. Not readily distinguishable from other black manganese minerals in the hand specimen. Ore of manganese.

Manganocolumbite. $(Mn,Fe)(Nb,Ta)_2O_6$. H = 6. Black, brownish-black tabular crystals. Occurs in granite pegmatite. Forms series with manganotantalite and ferrocolumbite.

Manganotantalite. $MnTa_2O_6$. H = 6-6.5. Brownish-black, tabular, short prismatic crystals, or massive. Dark red streak. Vitreous to resinous lustre. Iridescent on tarnished surfaces. Occurs in granite pegmatite. Columbite group.

Manganous manganite. $Na_4Mn_{14}O_{27}\cdot 9H_2O$. H = 1.5. Occurs as black to bluish-black, submetallic to dull, fine grained powdery coating associated with other manganese minerals and hematite. Synonym for birnessite.

Marble. See limestone.

Marcasite. FeS_2. H = 6-6.5. Light bronze to grey, metallic, radiating, stalactitic, globular, or fibrous; twinning produces cockscomb and spear shapes. Yellowish to dark brown tarnish. Massive variety is difficult to distinguish from pyrite in the hand specimen.

Mariposite. Bright green. Chrome variety of muscovite. Not a valid mineral name.

Martite. Fe_2O_3. H = 5.5-6.5. Black octahedral crystals. Dull to splendent lustre. Hematite pseudomorphous after magnetite.

Matildite. $AgBiS_2$. H = 2.5. Black to grey, metallic, granular massive; striated indistinct prismatic crystals (rare). Uneven fracture. Occurs intergrown with galena from which it alters. Associated with sulphide minerals in deposits formed at moderate to high temperatures.

Mattagamite. $CoTe_2$. Grey metallic with violet to pink tinge. Occurs as microscopic grains and bladed aggregates with altaite, pyrrhotite, and chalcopyrite. Named for Mattagami Lake, Quebec, which is near the mine where it was originally found.

Maucherite. $Ni_{11}As_8$. H = 5. Grey metallic with reddish tinge tarnishing to copper red. Tabular or pyramidal crystals; also massive, granular, or radiating fibrous. Decomposed by acids. Associated with cobalt-nickel ores.

Mawsonite. $Cu_6Fe_2SnS_8$. H = 3.5-4. Metallic microscopic irregular to rounded grains associated with bornite and other copper sulphide minerals.

Mckelveyite. $Ba_3Na(Ca,U)Y(CO_3)_6 \cdot 3H_2O$. Green, yellowish-green, or yellow crystal aggregates or platy crystals. Occurs with donnayite, natrolite, microcline in carbonate cavities at Mont Saint-Hilaire, Quebec.

Mckinstryite. $(Ag,Cu)_2S$. Steel grey metallic becoming black on exposure to air. Associated with silver ore minerals. Originally found in the Foster mine, Cobalt, Ontario.

Melaconite. CuO. Dull powdery coatings or masses; lustrous, resembling coal; reniform or colloform masses. Soluble in HCl or HNO_3. Known as copper pitch ore. Name changed to tenorite.

Melanterite. $FeSO_4 \cdot 7H_2O$. H = 2. Greenish white to green or blue, massive, pulverulent; also stalactitic, concretionary, fibrous, or capillary; short prismatic crystals (less common). Vitreous to dull lustre. Metallic, astringent taste. Soluble in water. Secondary mineral associated with pyrite and marcasite.

Melilite. $(Ca,Na)_2(Mg,Fe,Al)(Al,Si)O_7$. H = 5. White, light yellow, greenish; square or octagonal prisms. Vitreous to resinous lustre. Conchoidal to uneven fracture. Difficult to identify in the hand specimen.

Melonite. $NiTe_2$. H = 1-1.5. Reddish white, metallic, tarnishing to brown. Tiny hexagonal plates or lamellae. Dark grey streak. Perfect cleavage. Occurs with sulphides and other tellurides in nickel-copper deposits.

Meneghinite. $Pb_{13}Sb_7S_{24}$. H = 2.5. Blackish grey metallic. Slender, striated prismatic crystals, fibrous, massive. Oxidized by HNO_3. Associated with sulphides and sulphosalts.

Merenskyite. $(Pd,Pt)(Te,Bi)_2$. Minute metallic grains intergrown with platinum minerals. Distinguished from associated minerals by microscopic examination of polished surfaces.

Mertieite. $Pd_{11}(Sb,As)_4$. Yellow metallic grains, massive. Sparingly associated with platinum minerals.

Mesolite. $Na_2Ca_2Al_6Si_9O_{30} \cdot 8H_2O$. H = 5. Colourless or white acicular crystals and radiating aggregates; as tufts. Vitreous lustre. Generally associated with other zeolites in amygdaloidal basalts and distinguished from them by X-ray methods.

Metagabbro. A metamorphosed gabbro.

Metamict mineral. Mineral rendered amorphous by the destruction of its crystal structure by radiation from radioactive elements it contains. Zircon and allanite may be metamict.

Metasediments. Metamorphosed sedimentary rocks.

Metavolcanics. Metamorphosed volcanic rocks.

Miargyrite. $AgSbS_2$. H = 2.5. Black to dark grey metallic striated tabular crystals; massive. Red streak. Occurs with other silver sulphosalts and with sulphide minerals in low temperature hydrothermal veins.

Mica. A mineral group of hydrous aluminum silicates characterized by sheet-like platy structure producing perfect basal cleavage. Muscovite, biotite, and phlogopite are common members of this group.

Michenerite. (Pd,Pt)BiTe. H = 2.5. Greyish-white metallic minute grains; massive. Black streak. Associated with gold, platinum, and bismuth minerals. Originally described from the Frood mine, Sudbury, Ontario, and named in honour of geologist C.E. Michener who discovered the mineral.

Microcline. $KAlSi_3O_8$. H = 6. White, pink to red, or green (amazonite) crystals or cleavable masses. Distinguished from other feldspars by X-ray diffraction and chemical analysis. Triclinic member of K-feldspar.

Microlite. $(Ca,Na)_2Ta_2O_6(O,OH,F)$. H = 5-5.5. Yellow to brown, reddish octahedral crystals, grains, or massive. Translucent to opaque with vitreous lustre. Occurs with lithium minerals in granite pegmatites.

Micropegmatite. A granitic rock composed of an irregular microscopic intergrowth of quartz and K-feldspar. Synonym of granophyre.

Millerite. NiS. H = 3-3.5. Light brass-yellow slender, elongated, striated crystals; acicular radiating or hair-like aggregates. Grey iridescent tarnish. Distinguished from pyrite by its crystal form and its inferior hardness. Ore of nickel.

Minium. Pb_3O_4. H = 2.5. Bright red to brownish-red earthy, pulverulent masses with greasy to dull lustre. Orange-yellow streak. Affected by HCl and HNO_3. Secondary mineral formed by alteration of galena, cerussite.

Miserite. $K(Ca,Ce)_6Si_8O_{22}(OH,F)_2$. H = 5.5-6. Pink to light violet fibrous, scaly, or cleavable masses. Vitreous or pearly lustre. Associated with wollastonite, eudialyte, scapolite.

Mixite. $BiCu_6(AsO_4)_3(OH)_6 \cdot 3H_2O$. H = 3-4. Green acicular crystals with brilliant lustre; hair-like tufts; compact spherical masses. Occurs in copper and bismuth deposits.

Molybdenite. MoS_2. H = 1-1.5. Dark bluish-grey metallic tabular, foliated, scaly aggregates or hexagonal crystals; also massive. Sectile with greasy feel. Distinguished from graphite by its bluish lead-grey colour and by its streak (greenish on porcelain, bluish grey on paper). Ore of molybdenum.

Molybdite. MoO_3. Very soft, yellow fibrous or earthy crusts or coatings. Secondary mineral formed by alteration of molybdenite.

Molybdomenite. $PbSeO_3$. H = 3.5. Colourless to white, yellowish-white scaly aggregates. Pearly to greasy lustre. Occurs with clausthalite from which it forms.

Monadnock. A residual hill or mountain rising conspicuously above a peneplain having resisted the long erosion that produced the plain.

Monazite. $(Ce,La,Nd,Th)PO_4$. H = 5-5.5. Yellow, reddish-brown, or brown equant or flattened crystals and grains. Resinous to vitreous lustre. Radioactive. Resembles zircon but it is not as hard. Distinguished from titanite by its superior hardness and radioactivity. Occurs in granitic rocks. Ore of thorium.

Monteregianite. $(Na,K)_6(Y,Ca)_2Si_{16}O_{38}\cdot10H_2O$. H = 3.5. Colourless, white, grey, rarely light violet or light green. Transparent; vitreous to silky lustre. Acicular radiating or tabular crystals. Occurs in cavities in nepheline syenite at Mont Saint-Hilaire, Quebec, the type locality, where it is associated with calcite, pectolite, microcline, albite, aegirine, arfvedsonite. Named for the Monteregian Hills, Quebec, igneous monadnocks protruding from Ordovician limestone; Mont Saint-Hilaire is one of the Monteregian Hills.

Monticellite. $CaMgSiO_4$. H = 5. Colourless, grey, small prismatic crystals or grains. Vitreous lustre. Occurs in calcite and crystalline limestone. Related to the olivine group. Not readily identifiable in the hand specimen.

Montmorillonite. $(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2\cdot nH_2O$. H = 1-2. White, grey, greenish, yellowish, flaky or finely granular massive. Waxy to dull lustre; opaque. Expands with absorption of water becoming viscose, gelatinous.

Montroyalite. $Sr_4Al_8(CO_3)_3[(OH),F]_{26}\cdot10\text{-}11H_2O$. H-3.5. White translucent distorted spheres (1 mm across) with bumpy to botryoidal surface. Dull lustre. Soluble in HCl. Fluoresces white in ultraviolet light. Occurs on platy albite and quartz lining of cavities in silicocarbonatite sill at the Francon Quarry, Montreal, the type locality. Named after Mont Royal, the name given by Jacques Cartier to Mount Royal from which the name Montreal is derived.

Moorhouseite. $(Co,Ni,Mn)SO_4\cdot6H_2O$. H = 2.5. Pink, powdery with vitreous lustre and white streak. Occurs as coatings on barite-siderite-sulphide specimens. Soluble in water. Originally described from the Magnet Cove barite mine, Walton, Nova Scotia, and named in honour of W. Wilson Moorhouse, professor of geology, University of Toronto.

Mordenite. $(Ca,Na_2,K_2)Al_2Si_{10}O_{24}\cdot7H_2O$. H = 3-4. White, pink, or reddish tabular crystals; also as spheres or nodules with compact fibrous structure. Crystal form is not easily distinguished from other zeolites; compact fibrous structure is characteristic. Named for Morden, Nova Scotia, where it was first found.

Morenosite. $NiSO_4\cdot7H_2O$. H = 2-2.5. Light green to greenish-white fibrous encrustations; stalactitic. Generally translucent to opaque. Vitreous to dull lustre. Astringent metallic taste. Soluble in water. Secondary mineral formed by oxidation of nickel sulphide minerals.

Mosandrite. Alteration product of rinkite. Not a valid mineral name.

Mudstone. Hardened mud-like sediment composed chiefly of clay minerals.

Muscovite. $KAl_2(Si_3Al)O_{10}(OH,F)_2$. H = 2-2.5. Colourless or light green, grey, brown; transparent with splendent or pearly lustre. Tabular hexagonal crystals, sheet-like, platy, or flaky aggregates. Occurs in pegmatites. Constituent of granitic and metamorphic rocks. Sericite is a white silky fine scaly aggregate of muscovite that occurs as an alteration of minerals such as topaz, kyanite, feldspar, spodumene, and andalusite. Used as electrical and heat insulator; in cosmetics, paints, and wallpaper to produce a pearly lustre; in the manufacture of simulated pearls; as a filler for plastics.

Mylonite. Chert-like rock with streaky, banded, or flow structure.

Nacrite. $Al_2Si_2O_5(OH)_4$. H = 2-2.5. White thin tabular crystals; scaly or granular massive. Silky to earthy lustre. Kaolinite group.

Nahcolite. $NaHCO_3$. H = 2.5. Colourless, white prismatic crystals; fibrous, concretionary; fibrous, porous masses. Transparent to translucent; vitreous to resinous. Associated with sodium chloride, carbonate, borate, and sulphate minerals.

Narsarsukite. $Na_2(Ti,Fe)Si_4(O,F)_{11}$. H = 7. Yellow tabular or short prismatic crystals. Vitreous lustre. Weathers to brownish grey or brownish yellow. Rare mineral occurring in nepheline syenites and pegmatites.

Natrojarosite. $NaFe_3(SO_4)_2(OH)_6$. H = 3. Yellow to brownish-yellow earthy, minute tabular crystals. Dull lustre. Secondary mineral formed from alteration of iron minerals such as pyrite, marcasite.

Natrolite. $Na_2Al_2Si_3O_{10}{\bullet}2H_2O$. H = 5. Colourless, white, reddish needle-like crystals often forming radiating or nest-like aggregates; also nodular or slender prisms. Vitreous to pearly lustre. May be distinguished from other zeolites by its acicular habit. Occurs with other zeolite minerals in amygdaloidal basalt and in some igneous rocks.

Naumannite. Ag_2Se. H = 2.5. Dark grey to black metallic, tarnishing to iridescent brown. Granular massive, platy; cubic crystals. Associated with copper minerals and gold in vein deposits.

Nemalite. A fibrous variety of brucite.

Nenadkevichite. $(Na,Ca)(Nb,Ti)Si_2O_7{\bullet}2H_2O$. H = 5. Dark brown to pink foliated masses. Opaque; dull lustre. Occurs in alkalic igneous rocks.

Nepheline. $(Na,K)AlSiO_4$. H = 6. White to grey irregular masses, less commonly as hexagonal prisms. Greasy to vitreous lustre. Distinguished from feldspar and scapolite by its greasy lustre and by its gelatinizing in HCl. Used in the manufacture of glass and ceramics.

Nephrite. $Ca_2(Fe,Mg)_5Si_8O_{22}(OH)_2$. H = 6. Dense, compact fibrous variety of tremolite-actinolite group. Green to black, grey, white. Occurs in metamorphic rocks, peridotite, or serpentinite. Very tough. Nephrite is one variety of jade used as a gemstone and as an ornamental stone; another variety is jadeite.

Neptunite. $KNa_2Li(Fe,Mn)_2Ti_2Si_8O_{24}$. H = 5-6. Black, dark red prismatic crystals. Vitreous lustre. Occurs in nepheline syenite. Rare mineral.

New mineral. A mineral approved by the Commission on New Minerals and New Mineral Names of the International Mineralogical Association upon determining that the mineral's physical, structural, optical, and chemical properties are distinct from those of any known mineral. The proposed name of the new mineral must also be approved.

Niccolite. See nickeline.

Nickel bloom. Term used by miners for annabergite.

Nickeline. NiAs. H = 5-5.5. Copper-coloured to pinkish coppery, metallic, massive, reniform with columnar structure; crystals (tabular, pyramidal) rare. Exposed surfaces alter readily to annabergite. Occurs in veins with cobalt arsenides and native silver. Colour is distinctive. Formerly known as niccolite.

Niggliite. PtSn. H = 3. Silver-white metallic minute grains. Associated with platinum and palladium minerals.

Niocalite. $Ca_{14}Nb_2(Si_2O_7)_4O_6F_2$. H = 6. Yellow prismatic crystals with vitreous lustre; also massive granular. Occurs commonly as twinned crystals. Associated with other niobium minerals. Granular variety resembles apatite but is harder. Originally found in the niobium deposit at Oka, Quebec; named for the elements niobium and calcium.

Norbergite. $Mg_3(SiO_4)(F,OH)_2$. H = 6-6.5. Yellow to orange transparent to translucent squat crystals, grains. Vitreous to resinous lustre. Occurs in crystalline limestone. Humite group; distinguished from other members of the group by X-ray diffraction and chemical analysis.

Nordmarkite. A quartz-bearing syenite. Used as a building stone and an ornamental stone.

Nordstrandite. $Al(OH)_3$. H = 3. Colourless to white, yellowish, or greyish-white transparent, tabular, blade-like crystals or fine crystal aggregates. Vitreous, pearly to greasy lustre. Occurs in limestone and altered igneous rocks.

Norite. A gabbro with orthopyroxene (hypersthene) as the dominant ferromagnesian component.

Ochre. Impure iron oxides composed of limonite or goethite (yellow ochre), or of hematite (red ochre). Pulverulent, yellow, brownish red, massive. Used as a pigment.

Okenite. $Ca_{10}Si_{18}O_{46} \cdot 18H_2O$. H = 4.5.-5. White, vitreous to pearly blade-like crystals; compact fibrous massive. Occurs in amygdaloidal basalt.

Oligoclase. $(Na,Ca)(Al,Si)Si_2O_8$. H = 6-6.5. Colourless, white, pink, grey, greenish, yellowish, or brown transparent to translucent cleavable masses; tabular crystals (less common). Vitreous to pearly lustre. Occurs in pegmatite, granitic rocks. Plagioclase feldspar group.

Olivine. $(Mg,Fe)_2SiO_4$. H = 6.5. Yellowish to brownish-green vitreous, granular masses or rounded grains; also colourless, yellowish to brownish, black. Distinguished from quartz by its cleavage, from other silicates by its yellowish-green colour. Used in the manufacture of refractory bricks; transparent variety (peridot) used as a gemstone. Mineral group that includes the fayalite-forsterite series.

Opal. $SiO_2 \cdot nH_2O$. H = 5.5-6.5. Colourless, green, grey to black with waxy lustre, and iridescence (play of colour) in gem varieties. Common or non-gem variety lacks iridescence, is translucent to opaque, colourless to white, red, brown, grey, green, yellow, etc. Massive, botryoidal, mammillary, or pisolitic forms. Distinguished from chalcedony by its inferior hardness, lower specific gravity. Formed at low temperatures by silica-bearing waters seeping into fissures and cavities in sedimentary and volcanic rocks; silica is in the form of cristobalite.

Orpiment. As_2S_3. H = 1.5-2. Yellow foliated, columnar, fibrous, reniform, botryoidal, granular to powdery aggregates; short prismatic crystals (rare). Transparent to translucent with pearly or resinous lustre. Alteration product of arsenic minerals, notably realgar. Associated with arsenic and antimony minerals.

Orthoclase. $KAlSi_3O_8$. H = 6. Colourless, white, pink, green, grey, yellow transparent to translucent squat prismatic or tabular crystals; cleavable massive. Vitreous to pearly lustre. Perfect cleavage. Occurs as a constitutent of pegmatite and granitic rocks. Distinguished from plagioclase feldspar by the absence of twinning striations. Monoclinic variety of K-feldspar.

Orthogneiss. A gneiss derived from the metamorphism of an igneous rock.

Orthopyroxene. Orthorhombic variety of pyroxene, including enstatite and hypersthene.

Ottrelite. $(Mn,Fe,Mg)_2Al_4Si_2O_{10}(OH)_4$. H = 6.5. Green, grey to black tabular crystals; also scaly, platy, or foliated. Lamellar varieties resemble mica or chlorite but are distinguished by their brittleness and hardness. Occurs in metamorphosed sediments.

Overite. $CaMgAl(PO_4)_2(OH) \cdot 4H_2O$. H = 3.5-4. Light green to colourless platy crystals and aggregates; massive. Vitreous lustre. Soluble in hot HNO_3. Associated with other phosphate minerals.

Paragneiss. A gneiss derived from a sedimentary rock.

Parapierrotite. $Tl(Sb,As)_5S_8$. Black semimetallic small prismatic crystals. Occurs in cavities in realgar.

Pararammelsbergite. $NiAs_2$. H = 5. Light grey metallic rectangular tablets or massive. Exposed surfaces alter readily to erythrite. Associated with nickel and cobalt minerals in the Cobalt district, Ontario.

Pararealgar. AsS. H = 1-1.5. Yellow, orange-yellow to orange-brown powdery to granular aggregates. Vitreous to resinous lustre. Associated with realgar, stibnite.

Paratacamite. $Cu_2(OH)_3Cl$. H = 3. Green, dark green to greenish-black vitreous, translucent, to semi-opaque rhombohedral crystals; also granular massive, powdery encrustations, or fibrous or spherulitic aggregates. Easily soluble in acids. Secondary mineral formed by alteration of copper minerals.

Pargasite. $NaCa_2(Mg,Fe)_4Al(Si_6Al_2)_{22}(OH)_2$. H = 5-6. Bluish-green, light brown to brown, grey prismatic crystals or massive. Occurs in igneous and metamorphic rocks. Monoclinic member of the amphibole group.

Parisite. $Ca(Ce,La)_2(CO_3)_3F_2$. H = 4.5. Yellow, brownish, or greyish-yellow hexagonal pyramids or rhombohedral crystals. Striated. Transparent to translucent; vitreous, resinous, or pearly lustre. Soluble in hot acids.

Parkerite. $Ni_3(Bi,Pb)_2S_2$. H = 2. Bronze metallic. Exhibits lamellar twinning. Occurs as microscopic grains intimately associated with bismuthinite, native bismuth, cobalt pentlandite, siegenite, and bravoite at the Langis mine, Cobalt, Ontario. Effervesces in dilute HNO_3.

Pavonite. $AgBi_3S_5$. Grey metallic lath-like or elongated grains. Occurs in bismuthinite-matildite-native bismuth intergrowths in the Keeley mine, Cobalt, Ontario.

Pearceite. $Ag_{16}As_2S_{11}$. H = 3. Black metallic hexagonal tabular prisms with bevelled edges and triangular striations on the basal face. Decomposed by HNO_3. Associated with silver minerals such as argentite, native silver.

Pectolite. $NaCa_2Si_3O_8(OH)$. H = 5. White needle-like crystals forming radiating and globular masses. Silky to vitreous lustre. Decomposed by warm dilute HCl. Associated with zeolites in basalt. Blue gem variety known as larimar stone.

Pegmatite. A very coarse grained igneous rock occurring as dykes, lenses, and veins at the margins of batholiths.

Pekoite. $PbCuBi_{11}(S,Se)_{18}$. Grey metallic thin-bladed crystals associated with lead-bismuth minerals.

Pentlandite. $(Fe,Ni)_9S_8$. H = 3.5-4. Light bronze-yellow massive, granular aggregates. Octahedral parting distinguishes it from pyrrhotite with which it is commonly associated. Non-magnetic. Ore of nickel.

Periclase. MgO. H = 5.5. Colourless to grey and, less commonly, yellow, green, or black octahedrons or grains. Transparent with vitreous lustre. Soluble in dilute HCl. Distinguished from spinel by its inferior hardness; spinel is not soluble in HCl.

Peridotite. An igneous rock consisting almost entirely of olivine and pyroxene with little or no plagioclase feldspar.

Peristerite. White or reddish albite having a blue schiller (iridescence). Intergrowth of K-feldspar and albite. Also called moonstone. Used as a gemstone.

Perovskite. $CaTiO_3$. H = 5.5. Reddish-brown to black cubic or octahedral crystals; also granular massive. Adamantine to metallic lustre. Uneven fracture. White to grey streak. Distinguished from titanite by its crystal form, from pyrochlore by its lustre and streak.

Perrierite. $(Ca,Ce,Th)_4(Mg,Fe)_2(Ti,Fe)_3Si_4O_{22}$. H = 5.5. Dark reddish-brown to black opaque striated tabular plates, or flat prismatic crystals; resinous to greasy lustre. Occurs in crystalline limestone, in weathered tuffs. Resembles titanite; striations, platy habit, and lustre distinguish it from titanite.

Perthite. A subparallel intergrowth of pink microcline or orthoclase and colourless albite. Exhibits silky sheen with golden aventurescence. Named for Perth, Ontario, where it was originally found. Used as a gemstone. Not a valid mineral species.

Petalite. $LiAlSi_4O_{10}$. H = 6-6.5. Colourless, white, grey, or yellow, cleavable, massive. Vitreous to pearly lustre. Transparent to translucent. Associated with lepidolite in granite pegmatite.

Petarasite. $Na_5Zr_2Si_6O_{18}(Cl,OH)\cdot 2H_2O$. H = 5-5.5. Amber yellow, greenish yellow, massive. Transparent to translucent; vitreous. Associated with biotite, microcline, catapleiite, apatite, zircon, aegirine in nepheline syenite at Mont Saint-Hilaire, Quebec, the type locality. Named in honour of Dr. Peter Tarassoff, collector and amateur mineralogist of Dollard-des-Ormeaux, Quebec.

Petzite. Ag_3AuTe_2. H = 2.5-3. Light to dark grey metallic; massive granular. Associated with other tellurides in vein deposits. Decomposed by HNO_3.

Phenocryst. Distinct crystal in a fine grained igneous rock referred to as porphyry.

Phillipsite. $(K,Na,Ca)_{1-2}(Si,Al)_8O_{16}\cdot 6H_2O$. H = 4-4.5. White radiating aggregates of prismatic crystals with pyramidal terminations. Translucent to opaque, vitreous. Associated with other zeolites in basalt.

Phlogopite. $KMg_3Si_3AlO_{10}(F,OH)_2$. H = 2.5. Amber to light brown variety of mica. Used in the electrical industry.

Phosphorescence. Property of certain substances to continue to glow after heating or exposure to ultraviolet rays.

Phyllite. A lustrous metamorphic rock with a texture between that of schist and slate.

Picrolite. A nonflexible fibrous variety of antigorite (serpentine).

Piemontite. $Ca_2(Al,Mn,Fe)_3(SiO_4)_3(OH)$. Violet-red, reddish-brown to reddish-black prismatic or acicular crystals; also fibrous, massive. Occurs in igneous rocks and in schists. Epidote group. Also known as piedmontite.

Pitchblende. Massive uraninite containing trace amounts of thorium and rare earths. Not a valid mineral name.

Placer. Sand or gravel deposit containing gold and/or other heavy minerals; generally refers to deposits in paying quantities.

Plagioclase. $(Na,Ca)Al(Al,Si)Si_2O_8$. H = 6. White or grey tabular crystals and cleavable masses having twinning striations on cleavage surfaces. Vitreous to pearly lustre. Distinguished from other feldspars by its twinning striations. Feldspar group.

Platinum. Pt. H = 4-4.5. Grey metallic, grains, scales, nuggets, cubic crystals (rare). Hackly fracture. Malleable and ductile. Occurs in mafic and ultramafic igneous rocks and in placers.

Plumbojarosite. $PbFe_6(SO_4)_4(OH)_{12}$. Yellowish-brown to dark brown dull to silky, powdery, earthy, or compact encrustations; microscopic hexagonal plates. Soft, and feels like talc. Dissolves slowly in acids. Oxidation product of lead ores. Not readily identified in the hand specimen.

Pollucite. $(Cs,Na)_2Al_2Si_4O_{12}{\bullet}H_2O$. H = 6.5-7. Colourless, white, grey, massive; crystals (cubic) are rare. Transparent to translucent with vitreous to pearly lustre. Conchoidal to uneven fracture. Associated with spodumene, amblygonite in granite pegmatites. Resembles quartz but has a slightly greasy lustre. Zeolite group. Ore of cesium.

Polybasite. $(Ag,Cu)_{16}Sb_2S_{11}$. H = 2-3. Black metallic tabular crystals, or massive. Thin splinters are dark red. Decomposed by HNO_3. Occurs with silver-bearing minerals in veins.

Polycrase. $(Y,Ca,Ce,U,Th)(Ti,Nb,Ta)_2O_6$. H = 5.5-6.5. Black prismatic crystals; parallel to radial aggregates of crystals, or massive. Submetallic to greasy lustre. Yellowish, greyish, or reddish-brown streak. Radioactive. Conchoidal fracture. Occurs in granite pegmatite.

Polydymite. Ni_3S_4. H = 4.5-5.5. Grey metallic octahedral crystals, massive. Associated with other sulphide minerals in hydrothermal vein deposits.

Polylithionite. $KLi_2AlSi_4O_{10}(F,OH)_2$. H = 2.5-4. White, pink, micaceous; tabular crystals. Pearly lustre. Variety of lepidolite.

Polymorph. Mineral having the same chemical composition as another mineral but with a different crystal structure.

Porphyroblast. A large crystal formed in a metamorphic rock by recrystallization, e.g. garnet in schist. Also referred to as metacryst.

Porphyry. A dyke rock consisting of distinct crystals (phenocrysts) in a fine grained matrix. The matrix may be diorite, diabase, rhyolite, etc.; these terms are then used to describe the rock.

Posnjakite. $Cu_4(SO_4)(OH)_6{\bullet}H_2O$. H = 2-3. Minute blue flaky radiating sheaf-like aggregates on copper-bearing rocks. Associated with other secondary copper minerals; not readily distinguished from them in the hand specimen.

Prehnite. $Ca_2Al_2Si_3O_{10}(OH)_2$. H = 6.5. Light green globular, stalactitic masses with fibrous or columnar structure; tabular crystals. Vitreous lustre. Colour and habit are distinguishing features. Associated with zeolite minerals in basalt, and as an alteration of plagioclase.

Priceite. $Ca_4B_{10}O_{19}{\bullet}7H_2O$. H = 3-3.5. White earthy nodular or irregular masses. Occurs in gypsum and borate deposits. Soluble in acids.

Pringleite. $Ca_9B_{26}O_{34}(OH)_{24}Cl_4{\bullet}13H_2O$. H = 3-4. Colourless or orange prismatic crystals and platy aggregates. Transparent to translucent with vitreous lustre. Occurs with hilgardite, halite, and sylvite. Originally described from the Penobsquis potash mine, Sussex, New Brunswick, and named in honour of Gordon J. Pringle, Geological Survey of Canada.

Probertite. $NaCaB_5O_7(OH)_4{\bullet}3H_2O$. H = 3.5. Colourless, transparent acicular crystals; radiating crystal aggregates; massive. Occurs with other borate minerals. Soluble in dilute acids.

Proustite. Ag_3AsS_3. H = 2-2.5. Red with adamantine lustre. Prismatic crystals or massive. Associated with other silver minerals. Known as ruby silver. Ore of silver.

Pseudoixiolite. A disordered columbite-tantalite. Not a valid mineral name.

Pseudorutile. Renamed arizonite.

Psilomelane. $(Ba,H_2O)Mn_5O_{10}$. H = 5-6. Black massive, botryoidal, stalactitic, or earthy. Dull to submetallic lustre. Black streak. Associated with other manganese minerals, from which it is distinguished by superior hardness, black streak, and amorphous appearance. Ore of manganese. Not a valid mineral name. Renamed romanechite.

Pumpellyite. $Ca_2(Mg,Fe)Al_2(SiO_4)(Si_2O_7)(OH)_2{\bullet}H_2O$. H = 5.5. Bluish-green to green or white tiny fibrous aggregates; also platy, massive. Silky to vitreous lustre. Occurs in amygdaloidal basalt and in metamorphic rocks.

Pyrargyrite. Ag_3SbS_3. H = 2.5. Dark red prismatic crystals or massive. Adamantine lustre. Dark red streak. Occurs in veins carrying other silver minerals. Known as ruby silver. Ore of silver. Colour is identifying characteristic.

Pyrite. FeS_2. H = 6-6.5. Light brass-yellow (iridescent when tarnished) metallic crystals (cube, pyritohedron, octahedron), or massive granular. Distinguished from other sulphides by colour, crystal form, and superior hardness. Source of sulphur.

Pyroaurite. $Mg_6Fe_2(CO_3)(OH)_{16}{\bullet}4H_2O$. H = 2.5. Colourless, yellowish, blue, green, or white flaky, nodular or fibrous. Pearly or waxy lustre. Crushes to talc-like powder. Effervesces in HCl. Becomes golden yellow and magnetic when heated. Occurs with brucite in serpentine and in crystalline limestone.

Pyrochlore. $(Na,Ca)_2Nb_2O_6(OH,F)$. H = 5-5.5. Dark brown, reddish-brown to black octahedral crystals or irregular masses. Vitreous or resinous lustre. Light brown to yellowish-brown streak. Distinguished from perovskite by its lustre and streak, from titanite by its crystal form. Ore of niobium.

Pyrochroite. $Mn(OH)_2$. Colourless, yellow, light green, or blue, altering to dark brown and black on exposure to air. Associated with manganese minerals.

Pyroclastic rock. A rock composed of fragments of volcanic rocks.

Pyrolusite. MnO_2. H = 6-6.5 (crystals), 2-6 (massive). Light grey to dark grey metallic with bluish tint. Columnar, fibrous, or divergent masses; reniform, concretionary, granular to powdery and dendritic. Soils fingers easily and marks paper. Ore of manganese.

Pyromorphite. $Pb_5(PO_4)_3Cl$. H = 3.5-4. Green, yellow to brown prismatic crystals; also rounded barrel-shaped or spindle-shaped forms, subparallel crystal (prismatic) aggregates; globular, reniform, or granular. Resinous to subadamantine lustre. Crystal form, lustre, and high specific gravity (7.04) are distinguishing features. Soluble in acids. Secondary mineral formed in oxidized galena deposits.

Pyrope. $Mg_3Al_2(SiO_4)_3$. H = 7-7.5. Red transparent dodecahedral or trapezohedral crystals; grains. Vitreous lustre. Occurs in serpentinite, peridotite, and kimberlite. Used as a gemstone. Garnet group.

Pyrophanite. $MnTiO_3$. H = 5. Dark red or reddish-brown thin tabular crystals or fine flakes. Metallic to adamantine lustre. Conchoidal fracture. Ilmenite group.

Pyrophyllite. $Al_2Si_4O_{10}(OH)_2$. H = 1-2. White, grey, green, yellow, foliated, lamellar, fibrous, or granular compact masses. Pearly, greasy, or dull lustre. Resembles talc but has slightly superior hardness. Used for carved ornamental objects, in the manufacture of ceramics and insecticides, and for refractories.

Pyroxene. A mineral group consisting of Mg, Fe, Ca, and Na silicates related structurally. Diopside, augite, aegirine, jadeite, spodumene, enstatite, and hyperstene are members of the group. Common rock-forming mineral.

Pyroxenite. An igneous rock composed mainly of pyroxene with little or no feldspar.

Pyrrhotite. $Fe_{1-x}S$. H = 4. Brownish bronze, massive granular. Black streak. Magnetic; this property distinguishes it from pyrite and other bronze sulphides.

Quartz. SiO_2. H = 7. Colourless, yellow, violet, pink, brown, or black six-sided prisms with transverse striations, or massive. Transparent to translucent with vitreous lustre. Lack of cleavage distinguishes it from other colourless and white minerals. Rock-forming mineral. Occurs in veins in ore deposits. Used in glass and electronic industries. Transparent varieties used as gemstones.

Quartzite. A quartz-rich rock formed by metamorphism of sandstone. Used as a building stone, a monument stone, and an ornamental stone; high-purity quartzite is used in the manufacture of glass.

Radioactive minerals. Minerals which give off radiation due to spontaneous disintegration of uranium or thorium atoms. Detected by Geiger counter.

Raite. $Na_4Mn_4Si_8(O,OH)_{24} \cdot 9H_2O$ (?). H = 3. Gold to brown acicular crystals. Occurs in alkalic igneous rocks.

Rammelsbergite. $NiAs_2$. H = 5.5-6. Light grey metallic, tinged with red; massive with granular texture or prismatic, radial fibrous structure. Occurs in vein deposits with nickel and cobalt minerals such as smaltite, nickeline.

Ramsayite. $Na_2Ti_2Si_2O_9$. H = 6. Colourless fine acicular crystals. Vitreous lustre. Occurs in nepheline syenite. Rare mineral. Not readily identifiable in the hand specimen. Not a valid mineral name; renamed lorenzenite.

Ramsdellite. MnO_2. H = 3. Black massive or platy crystal aggregates. Metallic lustre and black streak. Associated with other manganese minerals in manganese deposits.

Rancieite. $(Ca,Mn)Mn_4O_9 \cdot 3H_2O$. Black, dark brown, grey metallic, massive; also lamellar. Associated with manganese minerals.

Rare-earth elements. A series of elements from atomic number 57 (lanthanum) to 71 (lutetium) and yttrium which were originally believed to be of rare occurrence.

Realgar. AsS. H = 1.5-2. Orange red to orange yellow, granular to compact massive; also striated short prismatic crystals. Resinous to greasy lustre. Transparent on freshly broken surface. Alters to light yellow to reddish-yellow powder (consisting of orpiment and arsenolite) on exposure to light. Occurs with orpiment and other arsenic minerals and with ores of antimony, lead, silver, and gold. Decomposed by HNO_3 and aqua regia.

Retgersite. $NiSO_46 \cdot H_2O$. H = 2. Dark green to blue-green fibrous encrustations and veinlets; crystals (prismatic) rare. Vitreous lustre. Greenish-white streak. Alteration product of nickeline.

Rhabdophane. $(Ce,La)PO_4 \cdot H_2O$. H = 3.5. Pinkish, yellowish-white, or brown stalactitic or botryoidal encrustations with radial structure. Translucent; waxy lustre. Occurs in pegmatites.

Rhodochrosite. $MnCO_3$. H = 4. Pink to rose, less commonly yellowish to brown, massive granular to compact; also columnar, globular, botryoidal; crystals (rhombohedral) uncommon. Vitreous lustre, transparent. Soluble in warm HCl. Distinguished from rhodonite (H = 6) by its inferior hardness. Ore of manganese.

Rhodonite. $MnSiO_3$. H = 6. Pink to rose red, massive, commonly veined with black manganese minerals. Conchoidal fracture, very tough. Resembles rhodochrosite from which it is distinguished by its superior hardness and lack of effervescence in HCl. Associated with manganese ores. Used as a gemstone and an ornamental stone.

Rhyolite. A fine grained volcanic rock with composition similar to granite.

Richterite. $Na_2Ca(Mg,Fe)_5Si_8O_{22}(OH)_2$. H = 5-6. Green, brown to brownish-red, yellow, rose-red long prismatic crystals. Transparent to translucent; vitreous. Monoclinic member of amphibole.

Rickardite. Cu_7Te_5. H = 3.5. Purplish red metallic; massive. Soluble in HNO_3. Associated with other tellurides from which it is distinguished by its colour resembling tarnished bornite.

Rinkite. $(Na,Ca,Ce)_3Ti(Si_2O_7)_2F_2(O,F)_2$. H = 5. Yellow, yellowish-green to brown tabular or prismatic crystals, and massive. Vitreous to greasy lustre. Rare mineral occurring in nepheline syenite. Not easily identified in the hand specimen.

Rock wool. Felted or matted fibres produced by blowing or spinning molten self-fluxing siliceous and argillaceous dolomitic limestone. Used as insulating material and for acoustic tiles. Now replaced by fibreglass for insulation.

Roemerite. $Fe_3(SO_4)_4{\bullet}14H_2O$. H = 3-3.5. Yellow to rust- or violet-brown, pink, powdery, granular, crystalline (tabular) encrustations; also stalactitic. Oily to vitreous; translucent. Saline, astringent taste. Formed from oxidation of pyrite. Not easily distinguished in the hand specimen from other iron sulphates.

Romeite. $(Ca,Fe,Mn,Na)_2(Sb,Ti)_2O_6(O,OH,F)$. H = 5.5-6.5. Yellow to brown small octahedral crystals; massive. Vitreous, greasy, or subadamantine lustre. White to light yellow streak. Occurs with rhodonite and other manganese minerals.

Roquesite. $CuInS_2$. H = 3.5-4. Grey metallic with bluish tint. As microscopic grains associated with copper ore minerals.

Roscoelite. $K(V,Al,Mg)_2(AlSi_3)O_{10}(OH)_2$. H = 2.5. Reddish-brown to greenish-brown scaly aggregates. Pearly lustre. Occurs in gold and vanadium deposits. Mica group.

Rose quartz. Pink to rose variety of quartz; used as an ornamental stone.

Routhierite. $TlHgAsS_3$. Reddish-black metallic grains and veinlets associated with stibnite, sphalerite, pyrite, realgar, and orpiment.

Roxbyite. Cu_9S_5. H = 2-3. Bluish-black metallic grains; bronze flakes. Occurs with other copper sulphides.

Rozenite. $FeSO_4{\bullet}4H_2O$. White or greenish-white finely granular, botryoidal, or globular encrustations. Metallic astringent taste. Difficult to distinguish in the hand specimen from other iron sulphates with which it is associated.

Ruby silver. The silver minerals, pyrargyrite and proustite, are known as ruby silver because of their colour.

Ruitenbergite. $Ca_9B_{26}O_{34}(OH)_{24}Cl_4{\bullet}13H_2O$. Monoclinic polymorph of pringleite with which it is associated and identical in appearance. Originally described from the Penobsquis potash mine, Sussex, New Brunswick, and named in honour of Arie A. Ruitenberg of the New Brunswick Geological Survey.

Rutile. TiO_2. H = 6-6.5. Brownish-red to black striated prismatic or acicular crystals; massive. Crystals are often twinned, forming elbow shapes. Adamantine lustre. Resembles cassiterite, but not as heavy and has light brown streak (cassiterite has white streak). Ore of titanium.

Sabinaite. $Na_4Zr_2TiO_4(CO_3)_4$. White powdery coatings, compact finely flaky aggregates. Silky to pearly lustre. Effervesces in warm HCl. Commonly coated with white powdery gibbsite-like mineral which fluoresces strongly in ultraviolet light. Associated with weloganite, dawsonite, quartz, calcite, and dresserite in igneous sills at Francon Quarry, the type locality. Named in honour of Ann P. Sabina, Geological Survey of Canada.

Safflorite. $(Co,Fe)As_2$. H = 4.5-5. Light grey metallic, massive with radiating fibrous structure; prismatic crystals resembling arsenopyrite. May form cruciform or six-ray star twins. Occurs with cobalt and nickel minerals and with native silver in vein deposits.

Samarskite. $(Y,Er,Ce,U,Ca,Fe,Pb,Th)(Nb,Ta,Ti,Sn)_2O_6$. H = 5-6. Black, brownish-black prismatic or tabular crystals, massive. Vitreous, resinous, or splendent lustre. Radioactive. Exposed surfaces alter to brown or yellowish brown. Conchoidal fracture. Dark brown to reddish or yellowish-brown streak. Occurs in granite pegmatites.

Samsonite. $Ag_4MnSb_2S_6$. H = 2.5. Dark grey to black metallic striated prisms. Associated with silver and manganese minerals.

Sanidine. Colourless glassy monoclinic variety of potash feldspar.

Sandstone. A sedimentary rock composed of sand-sized particles, mostly quartz.

Sapphirine. $Mg_{15}Al_{12}Si_2O_{27}$. H = 7.5. Light to dark blue, greenish-blue grains; also tabular crystals. Vitreous lustre. Uncommon mineral. Difficult to identify except by X-ray methods.

Scapolite. $Na_4Al_3Si_9O_{24}Cl - Ca_4Al_6Si_6O_{24}(CO_3,SO_4)$. H = 6. White, grey, or less commonly pink, yellow, blue, or green prismatic and pyramidal crystals; also massive granular with splintery, woody appearance. Vitreous, pearly to resinous lustre. Distinguished from feldspar by its square prismatic form, its prismatic cleavage, its splintery appearance on cleavage surfaces. May fluoresce under ultraviolet rays. Clear varieties may exhibit chatoyancy (cat's-eye effect) when cut in the cabochon style. Mineral group including marialite, meionite.

Schapbachite. High temperature form of matildite, $AgBiS_2$. Not a valid mineral name.

Scheelite. $CaWO_4$. H = 4.5-5. White, yellow, brownish, transparent to translucent; massive. Also dipyramidal crystals. High specific gravity (about 6). Generally fluoresces bright bluish white under short ultraviolet rays; this property is used in prospecting for this tungsten ore mineral.

Schiller. Internal near-surface reflection of light, producing a display of spectral colours, or iridescence, as in feldspar (peristerite).

Schist. A metamorphic rock composed mainly of flaky minerals such as mica and chlorite.

Scolecite. $CaAl_2Si_3O_{10} \cdot 3H_2O$. H = 5. Colourless to white prismatic crystals (generally twinned); also radiating acicular to fibrous aggregates. Vitreous lustre. Occurs in cavities in basalt. Zeolite group.

Scorodite. $FeAsO_4 \cdot 2H_2O$. H = 3.5-4. Green, greyish-green to brown crusts composed of tabular or prismatic crystals; also massive, earthy, porous, or sinter-like. Vitreous to subresinous or subadamantine lustre. Soluble in acids. Secondary mineral formed by oxidation of arsenopyrite.

Selenite. Colourless, transparent variety of gypsum.

Selenium. Se. H = 2. Grey metallic, acicular, tube-like crystals; aggregates of crystals forming sheets. Red streak. Associated with pyrite deposits.

Seligmannite. $PbCuAsS_3$. H = 3. Dark grey to black metallic; short prismatic to tabular crystals. Brown to purplish-black streak. Associated with sulphide and sulphosalt minerals.

Senarmontite. Sb_2O_3. H = 2-2.5. Colourless to greyish white, transparent; octahedral crystals or granular, massive. Forms crusts. Resinous to subadamantine lustre. Soluble in HCl. Secondary mineral formed by oxidation of antimony minerals. Minor ore of antimony.

Sepiolite. $Mg_4Si_6O_{15}(OH)_2{\bullet}6H_2O$. H = 2-2.5. White, greyish, yellowish, fibrous, scaly, earthy, clay-like, or compact nodular; silky, waxy, or dull lustre. Secondary mineral formed from serpentine, magnesite. Massive variety is referred to as meerschaum and was used for making tobacco pipes.

Serandite. $Na_6(Ca,Mn)_{15}Si_{20}O_{58}{\bullet}2H_2O$. Pink to reddish prismatic crystal aggregates. Vitreous lustre. Occurs with analcime, aegirine in nepheline syenite. Distinguished by its colour and crystal form.

Sericite. Fine scaly or fibrous muscovite, an important constituent of some schists and gneisses.

Serpentine. $(Mg,Fe)_3Si_2O_5(OH)_4$. H = 2-5. White, yellow, green, blue, red, brown, black massive; may be mottled, banded, or veined. Waxy lustre. Translucent to opaque. Asbestos (chrysotile) and picrolite are fibrous varieties. Formed by alteration of olivine, pyroxene, amphibole, or other magnesium silicates. Found in metamorphic and igneous rocks. Used as an ornamental building stone (verde antique) and for ornamental objects.

Serpentinite. A metamorphic rock consisting almost entirely of serpentine.

Serpierite. $Ca(Cu,Zn)_4(SO_4)_2(OH)_6{\bullet}3H_2O$. Light blue minute elongated lath-like crystals; also tufts, crusts of flattened fibres. Transparent with vitreous to pearly lustre. Secondary mineral associated with other sulphate minerals in copper deposits.

Shale. A fine grained sedimentary rock composed of clay minerals and having a laminated structure.

Shear zone. A region in which lateral movement along rock planes has produced crushed or brecciated rocks.

Siderite. $FeCO_3$. H = 3.5-4. Brown rhombohedral crystals, cleavable masses, earthy, botryoidal. Soluble in HCl. Distinguished from calcite and dolomite by its colour and higher specific gravity, from sphalerite by its cleavage. Ore of iron.

Siderotil. $FeSO_4{\bullet}5H_2O$. White, light green to bluish fibrous crusts, needle-like crystals, or finely granular encrustations. Vitreous lustre. Metallic, astringent taste. Not distinguishable in the hand specimen from other iron sulphates.

Siegenite. $(Ni,Co)_3S_4$. H = 4.5-5.5. Grey metallic, tarnishing to copper red. Octahedral crystals or massive granular. Uncommon mineral occurring with copper, nickel, or iron sulphides in vein deposits.

Silex. An obsolete term for flint. Used in the Gaspé region, Quebec, for grey to brown chalcedony pebbles found in the area.

Siliceous sinter. H = 7. White porous quartz. Occurs in cavities in basalt.

Sill. A long narrow body of igneous rock which parallels the structure of the rock it intrudes.

Sillimanite. Al_2SiO_5. H = 7. White, colourless, fibrous, or prismatic masses. Vitreous or silky lustre. Distinguished from wollastonite and tremolite by its superior hardness. Occurs in schists and gneisses.

Siltstone. A very fine grained sedimentary rock with composition between sandstone and shale, lacking the fissility of shale.

Silver. Ag. H = 2.5-3. Grey metallic arborescent, wiry, leaf, platy, or scaly forms; crystals (cubic, octahedral, dodecahedral) rare. Tarnishes to dark grey or black. Hackly fracture. Ductile, malleable. Colour, form, and sectility are identifying characteristics.

Sinhalite. $MgAl(BO_4)$. H = 6.5-7. Colourless, yellow, pink, greenish brown to pinkish brown, or dark brown transparent vitreous grains or massive. Occurs in skarn zones, in marble, and in crystalline limestone. Transparent varieties used as a gemstone.

Sjogrenite. $Mg_6Fe_2(CO_3)(OH)_{16}{\bullet}4H_2O$. H = 2.5. Transparent tiny thin hexagonal plates (flexible); colourless to yellowish or brownish white. Glistening, vitreous, or pearly lustre. Rare mineral associated with pyroaurite.

Skarn. An altered rock zone in limestone and dolomite in which calcium silicates (garnet, pyroxene, epidote, etc.) have formed.

Sklodowskite. $(H_3O)_2Mg(UO_2)_2(SiO_4){\bullet}2H_2O$. H = 2-3. Light yellow to greenish-yellow small acicular crystals or fibres forming rosettes, radial tufts; also powdery to earthy. Silky, vitreous to dull lustre. Secondary mineral formed from uranium minerals.

Skutterudite. $CoAs_{2-3}$. H = 5.5-6. Grey metallic cubic, cubo-octahedral, or pyritohedral crystals; massive, colloform. Resembles arsenopyrite but is distinguished by its crystal form. Associated with other cobalt, and nickel minerals in vein deposits.

Slate. A fine grained compact metamorphic rock characterized by a susceptibility to split into thin sheets.

Smaltite. $(Co,Ni)As_{3-x}$. An arsenic-deficient variety of skutterudite. Not a valid mineral name.

Smithsonite. $ZnCO_3$. H = 4-4.5. Greyish white to grey, greenish or bluish; also yellow to brown. Generally botryoidal, reniform, stalactitic, granular, porous masses; also indistinct rhombohedral crystalline aggregates. Vitreous lustre. Has high specific gravity (4.4). Effervesces in acids. May fluoresce bluish white under ultraviolet rays. Associated with zinc deposits.

Smythite. Fe_3S_4. Bronze to brownish-black metallic plates or flakes. Magnetic. Resembles pyrrhotite from which it is distinguished by X-ray diffraction. Occurs with other sulphides such as pyrrhotite, pyrite, chalcopyrite, marcasite.

Soapstone. A metamorphic rock composed chiefly of talc; massive fibrous texture and unctuous feel. Used as a carving medium, for refractory bricks, as marking crayons for metalworkers, and as heat resistant pads and plates.

Sodalite. $Na_8Al_6Si_6O_{24}Cl_2$. H = 6. Royal blue to purplish-blue granular masses, dodecahedral crystals. Vitreous lustre. Resembles lazurite but is harder, also distinguished by its association: sodalite in nepheline rocks, lazurite in crystalline limestone.

Soddyite. $(UO_2)_2SiO_4{\bullet}2H_2O$. H = 3.5. Yellow, amber-yellow to yellowish-green small bipyramidal or tabular crystals or radial fibrous aggregates; powdery to earthy masses and crusts. Vitreous, resinous to dull lustre. Secondary mineral formed from uraninite.

Spangolite. $Cu_6Al(SO_4)(OH)_{12}Cl{\bullet}3H_2O$. H = 3. Green tabular or prismatic crystals. Transparent with vitreous lustre. Secondary mineral occurring in copper deposits.

Specularite. Black variety of hematite having a brilliant lustre.

Sperrylite. $PtAs_2$. H = 6-7. Light grey metallic, cubic or cubo-octahedral crystals. Associated with pyrrhotite-pentlandite-chalcopyrite ores.

Spertiniite. $Cu(OH)_2$. Blue to blue-green transparent vitreous lath-like crystals forming microscopic botryoidal aggregates. Soluble in acids and decomposes in hot water. Associated with native copper, chalcocite, atacamite. Named in honour of Dr. Francis Spertini, geologist at the Jeffrey mine, Asbestos, Quebec, the type locality.

Spessartine. $Mn_3Al_2(SiO_4)_3$. H = 7-7.5. Orange to orange-red and brown transparent dodecahedral or trapezohedral crystals; grains. Vitreous lustre. Occurs in granite pegmatite. Used as a gemstone. Garnet group.

Sphalerite. ZnS. H = 3.5-4. Yellow, brown, or black, granular to cleavable massive; also botryoidal. Resinous to submetallic. Light yellow streak. Soluble in HCl, giving off H_2S. Ore of zinc.

Sphene. Synonym for titanite.

Spinel. $MgAl_2O_4$. H = 7.5-8. Dark green, brown, black, dark blue, pink, or red grains or octahedral crystals; also massive. Conchoidal fracture. Vitreous lustre. Distinguished from magnetite and chromite by its superior hardness and lack of magnetic property. Transparent varieties used as gemstones.

Spionkopite. $Cu_{39}S_{28}$. Grey to black metallic with green, violet iridescence; microscopic flakes forming aggregates. Generally intergrown with other copper sulphides. Originally described from sandstone and quartzite copper deposits in the Yarrow Creek and Spionkop Creek areas, southwestern Alberta; named for the locality.

Spodumene. $LiAlSi_2O_6$. H = 6.5. White, grey, pink, violet, green, long prismatic crystals or platy masses. Perfect cleavage. Vitreous lustre. Distinguished by its form and cleavage. Occurs in granite pegmatite. Ore of lithium. Used in ceramics. Transparent pink (kunzite), green (hiddenite), and yellow varieties are used as gemstone.

Stannite. Cu_2FeSnS_4. H = 4. Grey to greyish black metallic; granular massive or disseminated grains. Bluish tarnish. Black streak. Occurs in tin-bearing veins associated with chalcopyrite, sphalerite, tetrahedrite, pyrite, and cassiterite.

Starkeyite. $MgSO_4 \cdot 4H_2O$. Dull white encrustations. Bitter, metallic taste. Difficult to distinguish visually from other sulphates. Formerly known as leonhardtite.

Staurolite. $(Fe,Mg,Zn)_2Al_9(Si,Al)_4O_{22}(OH)_2$. H = 7. Brownish-yellow to brown prismatic crystals commonly twinned forming cruciform shapes. Vitreous to resinous lustre. Colour and habit are diagnostic. Occurs in schists and gneisses.

Steenstrupine. $(Ce,La,Na,Mn)_6(Si,P)_6O_{18}(OH)$. H = 5. Reddish-brown to black rhombohedral crystals or massive. Opaque. Occurs in nepheline syenite.

Stephanite. Ag_3SbS_4. H = 2-2.5. Black metallic striated prismatic or tabular crystals or massive. Decomposed by HNO_3. Occurs in veins in silver deposits.

Stibarsen. SbAs. H = 3-4. Tin white, reddish grey metallic; fibrous, lamellar, reniform, mammillary, or finely granular masses. Tarnishes to grey or brownish black. Perfect cleavage in one direction. Fuses to a metallic globule. Occurs in veins with other arsenic and antimony minerals, and in pegmatites containing lithium minerals.

Stibiconite. $Sb_3O_6(OH)$. H = 4.5-5. Yellow vitreous granular to powdery encrustations; also radiating fibrous aggregates (pseudomorphs after stibnite), botryoidal, or concentric. Secondary mineral formed by oxidation of stibnite and other antimony minerals. Yellow colour distinguishes it from other secondary antimony oxides. Minor ore of antimony.

Stibnite. Sb_2S_3. H = 2. Lead-grey, metallic (bluish iridescent tarnish), striated, prismatic crystals; also acicular crystal aggregates, radiating columnar or bladed masses, and granular. Soluble in HCl. Most important ore of antimony.

Stichtite. $Mg_6Cr_2(CO_3)(OH)_{16} \cdot 4H_2O$. Light violet scaly micaceous masses associated with serpentine. Also occurs as blebs and veinlets in serpentine.

Stilbite. $NaCa_2Al_5Si_{13}O_{36} \cdot 14H_2O$. H = 4. Colourless, pink, or white platy crystals commonly forming sheaf-like aggregates. Vitreous, pearly lustre. Transparent. Sheaf-like form distinguishes it from other zeolites with which it is associated in volcanic rocks. Also occurs in metamorphic and granitic rocks.

Stillwellite. $(Ce,La,Ca)BSiO_5$. Grey, pink, brownish-yellow, brownish-red to brown translucent to opaque, hexagonal tabular or rhombohedral crystals; also massive, compact, porcelain-like. Waxy to resinous lustre. Occurs with other rare-earth minerals in marble.

Stilpnomelane. $K(Fe,Al)_{10}Si_{12}O_{30}(OH)_{12}$. H = 4. Black, dark green, golden to reddish-brown foliated plates, fibrous aggregates. Associated with magnetite, hematite, goethite in iron deposits, and with chlorite and epidote in schists.

Stromeyerite. CuAgS. H = 2.5.-3. Dark grey metallic with blue tarnish. Prismatic crystals or massive. Soluble in HNO_3. Distinguished from arsenopyrite by its darker colour and inferior hardness.

Strontiodresserite. $(Sr,Ca)(Al_2CO_3)_2(OH)_4 \cdot H_2O$. White silky flakes forming coatings; white spheres (1 mm in diameter). Effervesces in HCl. Associated with weloganite, strontianite, quartz in igneous sill rock, Francon Quarry, Montreal, the type locality. Named for its chemical relationship to dresserite.

Strüverite. Black. Tantalum-rich variety of rutile.

Sudburyite. (Pd,Ni)Sb. Microscopic metallic grains occurring in cobaltite and maucherite. Identified by microscopic examination of polished section of ore minerals. Originally described from the Copper Cliff South and Frood mines, Sudbury, Ontario, and named for the locality.

Sulphur. S. H = 1.5-2.5. Yellow, reddish, greenish tabular, bipyramidal crystals; massive. Transparent; greasy to resinous lustre. Black when admixed with pyrite from which it alters.

Sunstone. A feldspar (orthoclase or oligoclase) containing flaky inclusions of goethite or hematite which cause bright copper-coloured reflections. Used as a gemstone.

Syenite. An igneous rock composed mainly of feldspar with little or no quartz. Used as a building stone.

Sylvanite. $(Au,Ag)Te_2$. H = 1.5-2. Light grey to dark grey metallic; prismatic or tabular crystals, bladed aggregates, granular. Associated with native gold and tellurides in vein deposits. Distinguished from other gold tellurides by its inferior hardness.

Sylvite. KCl. H = 2.5. Colourless, white, orange-red cubic crystals, or granular massive. Vitreous lustre. Sectile. Bitter taste. Soluble in water. Occurs with halite and gypsum. Used in fertilizers.

Synchisite. $(Ce,La)Ca(CO_3)_2F$. H = 4.5. Yellow to brown tabular or platy aggregates. Greasy, vitreous, or subadamantine lustre. Translucent. Soluble in acids. Associated with other rare-element minerals in pegmatite. Not easily distinguished in the hand specimen.

Synchisite-Y. $(Y,Ce)Ca(CO_3)_2F$. H = 6-7. Small pink to reddish-brown prisms; massive granular. Associated with yttrium minerals. Also known as doverite.

Szaibelyite. $(Mg,Mn)(BO_2)(OH)$. H = 3-3.5. White fine fibrous or platy matted or hair-like aggregates. Silky lustre. Soluble in acids. Uncommon mineral not readily identified in the hand specimen.

Szmikite. $MnSO_4 \bullet H_2O$. H = 1.5. White to pink, reddish, stalactitic, botryoidal masses. Earthy. Secondary mineral found with manganese minerals.

Szomolnokite. $FeSO_4 \bullet H_2O$. H = 2.5. White to pinkish white fine hair-like aggregates or finely granular encrustations; also botryoidal, globular crusts. Vitreous lustre. Metallic taste. Associated with pyrite and other iron sulphates from which it is not readily distinguishable in the hand specimen.

Talc. $Mg_3Si_4O_{10}(OH)_2$. H = 1. Grey, white, green, finely granular or foliated. Translucent with greasy feel. Massive impure varieties are known as steatite and soapstone, and because of their suitability for carving are used for ornamental purposes. Formed by alteration of magnesium silicates (olivine, pyroxene, amphibole, etc.) in igneous and metamorphic rocks. Used in cosmetics, ceramics, paint, plastic, rubber, chemical, roofing, and paper industries.

Tancoite. $HNa_2LiAl(PO_4)_2(OH)$. H = 4-4.5. Colourless to pink equant or tabular crystals, often elongated and commonly in parallel multiple growth. Transparent with vitreous lustre. Conchoidal fracture and two cleavages. Associated with lithiophosphate and apatite in spodumene-bearing pegmatite. Soluble in dilute HNO_3 and in HCl. Originally described from the Bernic Lake (Tanco) mine for which it is named.

Tapiolite. $Fe(Ta,Nb)_2O_6$. H = 6-6.5. Black short prismatic or equant crystals with submetallic to subadamantine lustre. Rusty or greyish-brown to brownish-black streak. Occurs in granite pegmatite.

Tellurantimony. Sb_2Te_3. Pink metallic lath-like microscopic grains associated with altaite. Originally found in the Mattagami Lake mine, Mattagami, Quebec. Named for its composition.

Tellurbismuth. Bi_2Tie_3. H = 1.5-2. Dark grey metallic platy, foliated aggregates. Laminae flexible; sectile. Triangular striations on cleavage surfaces. Occurs in auriferous quartz veins. Accepted name is tellurobismuthite.

Temiskamite. Name was given to a bronze-coloured material with radiating structure occurring in the Elk Lake-Gowganda (Ontario) silver-cobalt deposits. Synonym for maucherite. Not a valid mineral name.

Tengerite. $CaY_3(CO_3)_4(OH)_3 \bullet 3H_2O$. Dull white powdery, fibrous coating, or encrustations; associated with yttrium minerals from which it alters.

Tennantite. $(Cu,Fe)_{12}As_4S_{13}$. H = 3-4.5. Dark grey to greyish-black metallic tetrahedral crystals; compact to granular massive. Black, brown to red streak. Occurs in hydrothermal veins with copper, lead, zinc, and silver minerals. Forms a series with tetrahedrite but is much less abundant.

Tenorite. CuO. H = 3.5. Steel-grey to black metallic, platy, lath-like, scaly aggregates; also black, submetallic, earthy, or compact masses with conchoidal fracture. Associated with other copper minerals; melaconite occurs in the oxidized portion of copper deposits. Ore of copper.

Tetradymite. Bi_2Te_2S. H = 1.5-2. Light grey metallic indistinct pyramidal crystals; also bladed, foliated, or granular aggregates. Blades are flexible, inelastic. Tarnishes to dull or iridescent surfaces. Soils paper as does graphite. Occurs with telluride and sulphide minerals in gold-quartz veins formed at moderate to high temperatures, and in contact metamorphic deposits.

Tetrahedrite. $(Cu,Fe)_{12}Sb_4S_{13}$. H = 3-4.5. Dark grey to greyish-black metallic tetrahedral crystals; granular to compact massive. Black to brown streak. Ore of copper, silver-rich variety may be important ore of silver. Occurs with chalcopyrite, galena, pyrite, sphalerite, bornite, and argentite in hydrothermal veins. Forms a series with tennantite.

Tetranatrolite. $Na_2Al_2Si_3O_{10} \bullet 2H_2O$. White prismatic crystals and fibrous aggregates; earthy. Translucent to opaque; vitreous to dull lustre. Transparent in specimens freshly broken from the rock, becoming white, opaque, friable on exposure to air. Associated with natrolite, analcime, microcline in nepheline syenite at Mont Saint-Hilaire, Quebec. Named for its structure, tetragonal natrolite. Zeolite group.

Thaumasite. $Ca_3Si(OH)_6(CO_3)(SO_4) \bullet 12H_2O$. H = 3.5. Colourless to white acicular or massive. Transparent to translucent; vitreous, silky lustre to greasy. Occurs with calcium silicate and sulphate minerals.

Thenardite. Na_2SO_4. H = 2.5.-3. Colourless, white, greyish, reddish, yellowish, brownish, powdery; tabular, dipyramidal crystals. Dull to vitreous lustre. Formed from evaporation of salt lakes.

Thomsonite. $NaCa_2Al_5Si_5O_{20} \bullet 6H_2O$. H = 5-5.5. White, pinkish white to reddish, light green radiating columnar or fibrous masses; also compact. Vitreous to pearly lustre. Transparent to translucent. Associated with other zeolites. Massive variety used as a gemstone.

Thorbastnaesite. $Th(Ca,Ce)(CO_3)_2F_2 \bullet H_2O$. White silky fibres forming spheres less than 1 mm in diameter; coatings; Associated with baddeleyite, zircon (cyrtolite) at the Francon Quarry, Montreal.

Thorianite. ThO_2. H = 6.5. Dark grey to black cubic crystals or rounded grains. Dull to submetallic lustre. Grey streak. Radioactive. Soluble in HNO_3 and H_2SO_4. Occurs in pegmatites, crystalline limestone, stream gravels.

Thorite. $ThSiO_4$. H = 5. Black to reddish-brown tetragonal prisms with pyramidal terminations; also massive. Resinous to submetallic lustre. Conchoidal fracture. Radioactive. Distinguished by its crystal form, radioactivity. Source of thorium. Occurs in pegmatites, crystalline limestone, and hydrothermal veins.

Thorogummite. $Th(SiO_4)_{1-x}(OH)_{4x}$. Grey, light brown, yellowish brown to dark brown, earthy, nodular, massive; encrustation or replacement of thorite or thorium minerals. Secondary mineral formed from thorium minerals.

Thucholite. Hydrocarbon containing U, Th, rare earth elements, and silica. H = 3.5-4. Jet black with brilliant lustre and conchoidal fracture. Occurs in pegmatites. Not a valid mineral species.

Titanite (sphene). $CaTiSiO_5$. H = 6. Brown wedge-shaped crystals; also massive granular. May form cruciform twins. Adamantine lustre. White streak. Distinguished from other dark silicates by its crystal form, lustre, and colour.

Tochilinite. $6Fe_{0.9}S{\bullet}5(Mg,Fe)(OH)_2$. Black finely fibrous, acicular, flaky, or platy aggregates; bronze lustre. Occurs in serpentine and in serpentine-bearing marble. Distinguished from graphite by its bronze lustre. Alteration product of pyrrhotite.

Tomichite. $(V,Fe)_4Ti_3AsO_{13}(OH)$. Minute black opaque tabular crystals. Black streak. Associated with vanadian muscovite and quartz.

Tonalite. A quartz-rich diorite containing hornblende and biotite as the chief dark minerals.

Topaz. $Al_2SiO_4(F,OH)_2$. Colourless, white, light blue, yellow, brown, grey, or green prismatic crystals with perfect basal cleavage; also massive granular. Vitreous lustre, transparent. Distinguished by its crystal habit, cleavage, and hardness. Used as a gemstone.

Tourmaline. $Na(Mg,Fe)_3Al_6(BO_3)_3Si_6O_{18}(O,OH,F)_4$. H = 7.5. Black, dark green, blue, pink, brown, or yellow prismatic crystals; also columnar, granular. Prism faces are vertically striated. Vitreous lustre. Conchoidal fracture. Distinguished by its triangular cross-section in prisms and by its striations. Used in the manufacture of pressure gauges; transparent varieties are used as gemstones. Mineral group consisting of several species including dravite, schorl, elbaite, and uvite.

Trachyte. A light-coloured lava composed essentially of orthoclase with minor biotite, amphibole, and/or pyroxene.

Trap rock. Dark-coloured, fine grained dyke rock.

Trembathite. $(Mg,Fe)_3B_7O_{13}Cl$. H = 6-8. Colourless to light blue transparent rhombohedral crystals. Vitreous lustre. Occurs with hilgardite and halite. Originally described from the Salt Springs potash deposit, Sussex, New Brunswick, and named in honour of Professor Lowell T. Trembath, University of New Brunswick.

Tremolite. $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$. H = 5-6. White, grey striated prismatic crystals, bladed crystal aggregates, or fibrous; perfect cleavage. Usually occurs in metamorphic rocks. Fibrous variety is used for asbestos. Monoclinic member of amphibole.

Triphylite. $LiFePO_4$. H = 4-5. Greenish to bluish grey cleavable to compact massive; prismatic crystals rare. Transparent to translucent with vitreous to subresinous lustre. Occurs with lithium and phosphate minerals in granite pegmatite.

Troctolite. A gabbro with olivine as the dominant ferromagnesian component.

Trondhjemite. A light-coloured igneous rock composed mainly of Na-plagioclase with quartz and biotite.

Tuff. A rock formed from volcanic ash.

Tundrite. $Na_2Ce_2(Ti,Nb)SiO_8{\bullet}4H_2O$. H = 3. Brownish or greenish-yellow acicular crystals occurring individually or forming spheres. Occurs in nepheline syenite.

Tungstenite. WS_2. H = 2.5. Dark grey metallic massive, or fine scaly aggregates. Associated with scheelite, wolframite, and sulphide minerals.

Tungstite. $WO_3 \bullet H_2O$. H = 2.5. Yellow to yellowish-green aggregates of microscopic plates, or powdery to earthy masses. Resinous or pearly lustre. Oxidation product of tungsten minerals.

Tungusite. $Ca_4Fe_2Si_6O_{15}(OH)_6$. H ~ 2. Green to yellow-green platy aggregates resembling chlorite. Pearly lustre. Associated with analcime and other zeolites in lava.

Tvalchrelidzeite. $Hg_{12}(Sb,As)_8S_{15}$. Dark grey metallic granular aggregates with dark reddish tint. Adamantine lustre. Associated with cinnabar and realgar.

Twinnite. $Pb(Sb,As)_2S_4$. Black metallic minute grains. Streak is black with brownish tint. Rare mineral associated with other sulphosalts. Originally described from a prospect pit located near Madoc, Ontario.

Type locality. Locality from which a mineral species was originally described.

Ulexite. $NaCaB_5O_6(OH)_6 \bullet 5H_2O$. H = 1. White with silky lustre. Occurs as nodules composed of fine fibres and as compact fibrous veins. Source of borax. Occurs in gypsum deposits in Nova Scotia and New Brunswick.

Ullmannite. NiSbS. H = 5-5.5. Silver-white to grey metallic cubic, octahedral, or pyritohedral crystals with striations on cube faces. Greyish-black streak. Perfect cleavage. Occurs with nickeline and other nickel minerals in vein deposits. Distinguished from pyrite by its colour.

Umangite. Cu_3Se_2. H = 3. Bluish-black, grains or massive granular. Metallic lustre. Associated with copper sulphide and selenide minerals such as chalcocite, chalcomenite, and chalcopyrite.

Unakite. A rock consisting of pink to orange-red feldspar, epidote, and some quartz. Used as an ornamental stone.

Uraconite. Probably a U-sulphate. Yellow to green, earthy, nodular, scaly, or botryoidal crust. Not a valid mineral species.

Uraninite. UO_2. H = 5-6. Black, brownish-black cubic or octahedral crystals; also massive, botryoidal. Submetallic, pitchy to dull lustre. Uneven to conchoidal fracture. Radioactive. Distinguished by its high specific gravity (10.3 to 10.9), crystal form, and radioactivity.

Uranophane. $(H_3O)_2Ca(UO_2)_2(SiO_4)_2 \bullet 3H_2O$. H = 2-3. Yellow fibrous, radiating aggregates; massive. Occurs with uraninite from which it alters.

Uranothorite. $(Th,U)SiO_4$. H = 4.5-5. Black prismatic crystals, grains. Pitchy lustre. May have orange-coloured sunburst effect on enclosing rock. Radioactive. Occurs in granitic and pegmatitic rocks. Granular variety distinguished from thorite and uraninite by X-ray methods. Variety of thorite containing uranium. Not a valid mineral name.

Uranpyrochlore. $(U,Ca,Ce)_2(Nb,Ta)_2O_6(OH,F)$. H = 4.5. Yellowish-brown to black octahedral crystals or massive. Resinous to adamantine lustre. Occurs in granite pegmatite. Pyrochlore group.

Valentinite. Sb_2O_3. H = 2.5-3. Colourless, white, to greyish prismatic or tabular striated crystal aggregates; also massive with granular or fibrous structure. Adamantine to pearly lustre. Transparent. Associated with stibnite and secondary antimony oxides resulting from oxidation of metallic antimony minerals.

Valeriite. $4(Fe,Cu)S \cdot 3(Mg,Al)(OH)_2$. Very soft, sooty. Bronze black platy, massive with perfect cleavage. Occurs in high-temperature copper deposits.

Veatchite. $Sr_2B_{11}O_{15}(OH)_5 \cdot H_2O$. H = 2. Colourless, transparent platy or prismatic crystals; white fibrous masses with silky lustre. Occurs with howlite, colemanite, and other borate minerals.

Vermiculite. $Mg_3Si_4O_{10}(OH)_2 \cdot xH_2O$. H = 1.5. Silvery-amber or light brown flaky, sheet-like aggregates. Pearly lustre. Expands or exfoliates on heating, which distinguishes it from mica. Formed by alteration of phlogopite and biotite. Used as an insulator in the construction industry, for concrete and plaster, as a lubricant, and as a soil conditioner.

Vesuvianite. $Ca_{10}Mg_2Al_4(SiO_4)_5(Si_2O_7)_2(OH)_4$. H = 7. Yellow, brown, green, violet transparent, prismatic, or pyramidal crystals with vitreous lustre; also massive, granular, compact, or pulverulent. Distinguished from other silicates by its tetragonal crystal form; massive variety is distinguished by its ready fusibility and intumescence in a blowpipe flame. Also known as idocrase. Transparent varieties are used as a gemstone.

Villiaumite. NaF. H = 2-2.5. Dark red, pink, orange, finely crystalline or massive. Transparent; vitreous. Occurs in nepheline syenite.

Vinogradovite. $(Na,Ca,K)_4Ti_4AlSi_6O_{23} \cdot 2H_2O$. H = 4. Colourless to white fibrous and spherical aggregates; prismatic crystals less common. Transparent; vitreous. Occurs in nepheline syenite.

Violarite. $FeNi_2S_4$. H = 4.5-5.5. Light grey, brilliant metallic; tarnishes to violet grey. Massive. Distinguished by its violet tarnish. Associated with copper, nickel, and iron sulphides in vein deposits. Rare mineral.

Vivianite. $Fe_3(PO_4)_2 \cdot 8H_2O$. H = 1.5-2. Colourless transparent when fresh, becoming blue, greenish blue to dark blue translucent due to oxidation. Vitreous to dull lustre. Prismatic crystals; bladed, globular, fibrous, powdery to earthy aggregates. Streak is colourless to bluish white quickly altering to dark blue or brown. Soluble in acids. Darkens in H_2O_2. Occurs as a secondary mineral in metallic ore deposits and as a weathering product of iron-manganese phosphates in pegmatites.

Vlasovite. $Na_2ZrSi_4O_{11}$. Colourless to light brown crystals and grains. Vitreous, pearly, or greasy lustre. Excellent cleavage. Occurs in alkalic rocks.

Voggite. $Na_2Zr(PO_4)(CO_3)(OH) \cdot 2H_2O$. Colourless, transparent acicular microscopic crystals; white matted fibres. Occurs in centimetric cavities in an amygdaloidal basalt dyke cutting a weloganite-bearing sill at the Francon Quarry, Montreal, the type locality. Resembles dawsonite. Name in honour of its discoverer, mineral collector Adolf Vogg of Arnprior, Ontario.

Volkovskite. $KCa_4[B_9O_8(OH)_4]_4[B(OH)_3]_2Cl \cdot 4H_2O$. H = 2.5. Colourless to pink thin platy crystals. Transparent with vitreous lustre. Occurs with other borate minerals in potash deposits.

Voltaite. $K_2Fe_9(SO_4)_{12} \cdot 18H_2O$. H = 3. Greenish-black to black, dark green cubic or octahedral crystals; also massive granular. Resinous lustre. Greyish-green streak and conchoidal fracture. Decomposed by water, leaving a yellow precipitate. Soluble in acids. Associated with other iron sulphate minerals.

Wacke. A sandstone consisting of generally unsorted angular mineral and rock fragments in a clay-silt matrix.

Wad. A field term used for substances consisting mainly of manganese oxides.

Wakefieldite. YVO_4. H = 5. Amber, yellow, brownish, white, grey, pulverulent; coatings. Dull lustre. Occurs in pegmatite with rare-element minerals. Named for Wakefield Lake, Quebec, which is near the Evans-Lou mine, the type locality.

Wallrock. Rock forming the walls of a vein, dyke, or other ore deposit.

Warwickite. $(Mg,Ti,Fe,Al)_2(BO_3)O$. H = 3.5-4. Black opaque prismatic crystals without terminations, rounded grains, granular aggregates. Adamantine to submetallic, dull, or pearly lustre. May have coppery-red tarnish on the surface. Occurs with spinel, chondrodite, serpentine in crystalline limestone.

Waterlime. A clayey limestone containing alumina, silica, and lime in the proper proportions to produce cement by the addition of water. Also known as cement rock.

Wehrlite. Mixture of hessite (Ag_2Te) and pilsenite (Bi_4Te). Not a valid mineral species.

Weloganite. $Sr_3Na_2Zr(CO_3)_6 \cdot 3H_2O$. H = 3.5. Transparent yellow to orange-yellow, colourless prismatic crystals terminated by pyramids; also massive. Conchoidal fracture. Vitreous lustre. Effervesces in HCl. Originally found at the Francon Quarry, Montreal, and named for Sir William E. Logan, first director of the Geological Survey of Canada.

Whitlockite. $Ca_9(Mg,Fe)H(PO_4)_7$. H = 5. Colourless to white, grey, or yellowish rhombohedral crystals; granular to earthy massive. Transparent to translucent with vitreous to subresinous lustre. Soluble in dilute acids. Occurs in phosphate rock deposits and in pegmatites.

Willemite. Zn_2SiO_4. H = 5.5. Colourless, yellow, green, white, reddish-brown, massive or granular; also prismatic crystals. Vitreous lustre. Soluble in HCl. May fluoresce green. Nonfluorescent variety difficult to identify in hand specimen. Minor ore of zinc.

Wilsonite. An altered scapolite (to muscovite). Pink, rose red, mauve to violet. Translucent variety used as a gemstone. Named for Dr. James Wilson of Perth, Ontario, where it was originally found. Not a valid mineral name. The term "pinite" is more correctly applied to muscovite alteration from scapolite, feldspar, or spodumene.

Witherite. $BaCO_3$. H = 3-3.5. Colourless to white, greyish, yellowish, greenish, or brownish six-sided dipyramids and prisms; also tabular, globular, botryoidal, fibrous, or granular massive. Transparent to translucent with vitreous to resinous lustre. Effervesces in dilute HCl. Occurs with barite and galena in low-temperature hydrothermal veins.

Wittichenite. Cu_3BiS_3. H = 2-3. Grey metallic tabular crystals or columnar, acicular aggregates; massive. Fuses easily. Soluble in HCl and gives off H_2S; decomposed by HNO_3. Alters readily to yellowish brown, red, blue, and eventually forms covellite.

Wodginite. $(Ta,Nb,Sn,Mn,Fe)_{16}O_{32}$. H ~ 6. Reddish-brown to dark brown and black irregular grains. Submetallic lustre. Occurs in granitic rocks. Ore of tantalum with uses in electrolytic, nuclear reactor, and aircraft industries.

Wöhlerite. $NaCa_2(Zr,Nb)Si_2O_8(O,OH,F)$. H = 5.5-6. Yellow, brown, orange tabular or prismatic crystals. Vitreous lustre. Occurs in nepheline syenite. Rare mineral.

Wolframite. $(Fe,Mn)WO_4$. H = 4-4.5. Dark brown to black short prismatic striated crystals; lamellar or granular. Submetallic to adamantine lustre. Perfect cleavage in one direction. Distinguishing features are colour, cleavage, and high specific gravity (7.1-7.5). Ore of tungsten.

Wollastonite. $CaSiO_3$. H = 5. White to greyish white compact, cleavable, or fibrous masses with splintery or woody structure. Vitreous to silky lustre. May fluoresce in ultraviolet light. Distinguished from tremolite (H = 6) and sillimanite (H = 7) by its inferior hardness and by its solubility in HCl. Occurs in crystalline limestone and skarn zones. Used in ceramics and paints.

Woodhouseite. $CaAl_3(PO_4)(SO_4)(OH)_6$. H = 4.5. Violet, pink, white, or colourless tiny, pseudocubic striated crystals. Vitreous, transparent. Secondary mineral associated with topaz, lazulite, pyrophyllite.

Wurtzite. $(Zn,Fe)S$. H = 3.5-4. Brownish-black resinous crystals (pyramidal, prismatic, tabular) or fibrous, columnar, concentrically banded crusts. Like sphalerite but has darker colour and brown streak. Occurs with sulphide minerals.

Xanthoconite. Ag_3AsS_3. H = 2-3. Dark red to orange or brown tabular or lath-shaped crystals. Adamantine lustre. Orange-yellow streak. Fuses readily. Associated with ruby silver; at LaRose mine and at Keeley mine, Cobalt, Ontario.

Xenotime. YPO_4. H = 4.5. Reddish or yellowish-brown, grey prismatic crystals similar to zircon. Vitreous to resinous lustre. Distinguished from zircon by its inferior hardness. Occurs in pegmatites and alkalic igneous rocks.

Xonotlite. $Ca_6Si_6O_{17}(OH)_2$. H = 6.5. Pink to white microscopic to fine compact fibrous masses. Vitreous to waxy lustre. Very tough. Weathered surface is chalk white. Pink variety is used as a gemstone.

Yarrowite. Cu_9S_8. Dark grey to black metallic flaky or platy (microscopic) aggregates with green-violet iridescence. Associated with chalcopyrite, bornite, and other copper minerals from which it alters. Indistinguishable in the hand specimen from spionkopite. Originally described from the sandstone and quartzite copper deposits in the Yarrow and Spionkop Creeks area, southwestern Alberta; named for the locality.

Yofortierite. $Mn_5Si_8O_{20}(OH)_2(OH_2)_4 \cdot 8\text{-}9H_2O$. H = 2.5. Pink to violet radiating fibres. Associated with analcime, serandite, eudialyte, polylithionite, aegirine, microcline, and albite in pegmatite veins cutting nepheline syenite at Mont Saint-Hilaire, Quebec, the type locality. Named in honour of Dr. Y.O. Fortier, Arctic geologist and director (1964-1973) of the Geological Survey of Canada.

Yttrofluorite. Yttrian fluorite with yttrium substituting for Ca. Yellow, brown, violet, or blue, granular massive. Density and hardness are somewhat greater than in fluorite. Not a valid mineral name.

Yttrotantalite. $(Y,U,Fe)(Ta,Nb)O_4$. H = 5-5.5. Black to dark brown prismatic or tabular crystals; irregular grains, massive. Submetallic, vitreous to greasy lustre and conchoidal fracture. Grey streak. Occurs in pegmatites.

"Yukon diamond". A term used in the North for concentrically banded black, dark brown, or tan cassiterite pebbles found in Yukon placers. Also known as wood tin. Used as a gemstone.

Yukonite. $Ca_3Fe_3(AsO_4)_4OH \bullet 12H_2O$. H = 2-3. Black to dark brown irregular masses. Decrepitates at low heat and when immersed in water. Easily fusible. Found originally at Tagish Lake, Yukon. Named for the locality.

Zavaritskite. BiOF. Yellow to grey granular to powdery with greasy to submetallic lustre. Associated with bismutite, bismuthinite, bismuth.

Zeolites. A group of hydrous silicates of related composition but differing crystallization; water is given off continuously when heated but can be taken up again. Heulandite, chabazite, stilbite, natrolite, analcime belong to this group. Formed from magmatic or hydrothermal solutions, or by alteration of feldspar minerals. Used as water-softeners, as gas and impurity absorbents, and in heat reservoirs.

Zinc. Zn. H = 2. Light grey metallic crystals, grains, scales. Brittle. Perfect cleavage. Formed from oxidation of sphalerite.

Zinkenite. $Pb_9Sb_{22}S_{42}$. H = 3-3.5. Grey metallic columnar to radial fibrous aggregates, massive; indistinct slender striated prisms. Tarnishes to iridescent surfaces. Occurs with stibnite, jamesonite, and other sulphosalts, and galena, pyrite, and sphalerite in veins formed at low to moderate temperatures.

Zircon. $ZrSiO_4$. H = 7.5. Pink, reddish to greyish-brown tetragonal prisms terminated by pyramids; also colourless, green, violet, or grey. May form knee-shaped twins. Adamantine lustre. May be radioactive. Distinguished by its crystal form, hardness. Ore of zirconium and hafnium. Used in moulding sand, ceramics, and refractory industries; transparent varieties are used as gemstones.

Zoisite. $Ca_2Al_3(SiO_4)_3(OH)$. H = 6.5. Grey to brownish-grey, yellowish-brown, violet-pink, green aggregates of long prismatic crystals (striated); also compact fibrous to columnar masses. Vitreous to pearly lustre. Transparent to translucent. Massive variety distinguished from amphibole by its perfect cleavage. Transparent varieties used as gemstones; pink variety known as thulite, transparent blue variety as tanzanite.

CHEMICAL SYMBOLS FOR SELECTED ELEMENTS

Ag - silver
Al - aluminum
As - arsenic
Au -gold
B - boron
Ba - barium
Be - beryllium
Bi - bismuth
Br - bromine
C - carbon
Ca - calcium
Cd - cadmium
Ce - cerium
Cl - chlorine
Co - cobalt
Cr - chromium
Cs - cesium
Cu - copper
Dy - dysprosium
Er - erbium
F - fluorine
Fe - iron
Ga - gallium
Gd - gadolinium
Ge - germanium
H - hydrogen
Hf - hafnium
Hg - mercury
I - iodine
In - indium
Ir - iridium
K - potassium
La - lanthanum
Li - lithium
Mg - magnesium
Mn - manganese
Mo - molybdenum
N - nitrogen
Na - sodium
Nb - niobium
Nd - neodymium
Ni - nickel
O - oxygen
P - phosporus
Pb - lead
Pd - palladium
Pt - platinum
Rb - rubidium
Re - rhenium
Rh - rhodium
Ru - ruthenium
S - sulphur
Sb - antimony
Sc - scandium
Se - selenium
Si - silicon
Sm - samarium
Sn - tin
Sr - strontium
Ta - tantalum
Te - tellurium
Th - thorium
Ti - titanium
Tl - thallium
U - uranium
V - vanadium
W - tungsten
Y - yttrium
Yb - ytterbium
Zn - zinc
Zr - zirconium

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INDEX OF MINES AND OCCURRENCES